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CGMS

Report of the 39th Meeting of the Coordination Group for Meteorological Satellites

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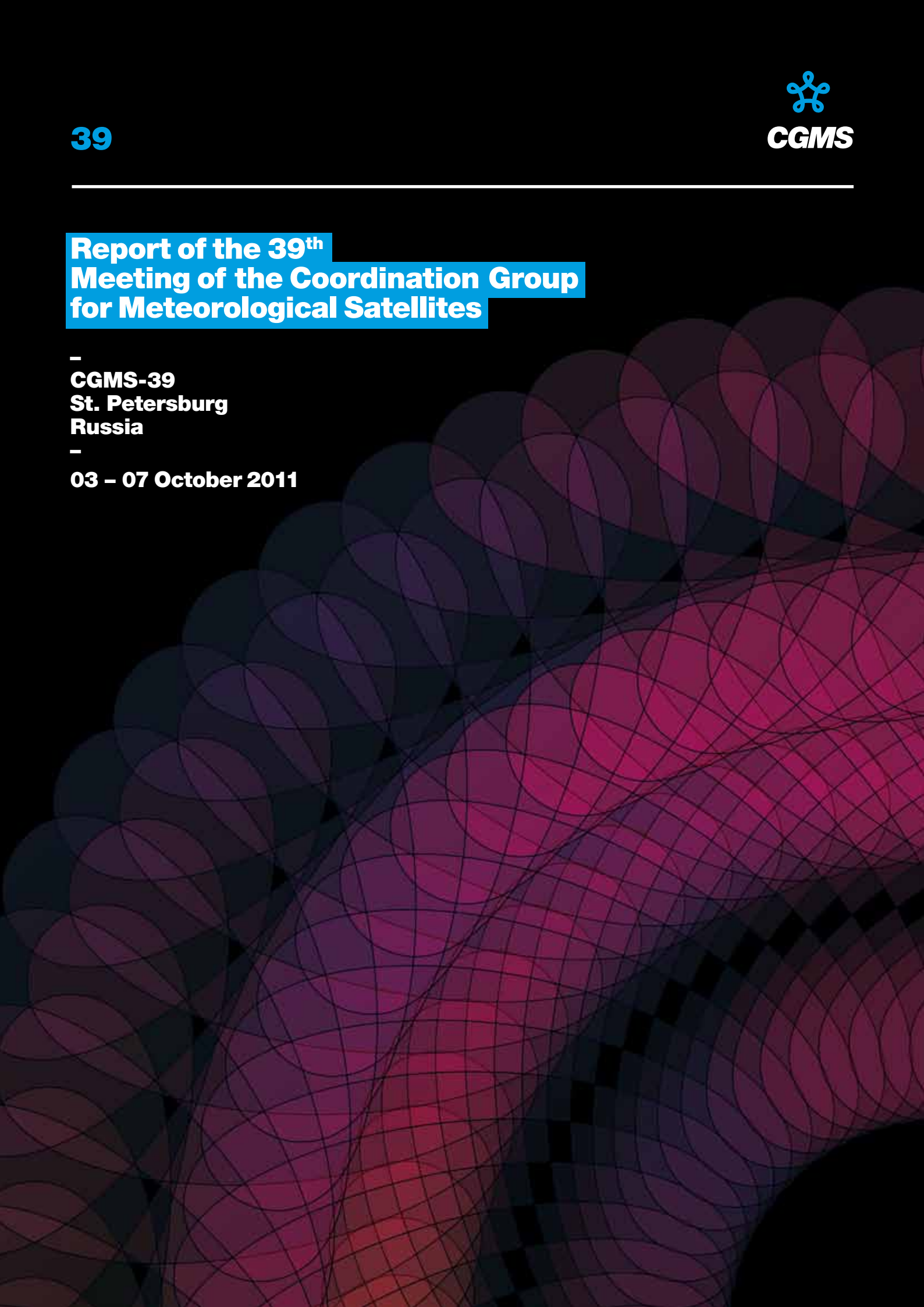
CGMS-39
St. Petersburg
Russia
–
03 – 07 October 2011



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Please note that this report is published together with a CD-ROM containing an electronic version of the report and all working papers presented at CGMS-39.

Report edited on behalf of CGMS by:

CGMS Secretariat
EUMETSAT
Eumetsat Allee 1
D-64295 Darmstadt
Germany

www.eumetsat.int
www.cgms-info.org
cgmssec@eumetsat.int

CGMS MR 39

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A. INTRODUCTION

A.1 Welcome

On behalf of ROSHYDROMET, Dr. Valery Dyadyuchenko, Deputy Head of ROSHYDROMET, officially opened CGMS-39 at 09:00 on 3 October 2011, in St Petersburg, Russian Federation.

Dr. Valery Dyadyuchenko welcomed the participants of the 39th Session of CGMS to the Sokos Palace Brige Hotel. He recalled that CGMS is a joint international space meteorological system, which consists of national orbital satellite groups. He further announced that Russia's recent contribution to this system was the launch of polar-orbiting Meteor-M1 satellite in 2009 and geostationary Elektro-L#1 satellite in 2011.

He thanked EUMETSAT, the CGMS Secretariat, for the support provided in the preparations and the Saint-Petersburg city administration that also provided an invaluable support.

Mr Ivan Alexandrovich Serebritsky, Deputy Head of the St. Petersburg Department of Natural Resources Management and Environmental Protection addressed the assembly and gave an overview of the history of St Petersburg.

On behalf of the CGMS Secretariat, Dr Mikael Rattenborg, EUMETSAT Director of Operations, also welcomed the participants, and expressed his sincere thanks to ROSHYDROMET for hosting the CGMS meeting and for the excellent organisational arrangements. Furthermore, he recalled EUMETSAT's long-standing commitment to CGMS and its willingness to continue supporting the role of CGMS Secretariat.

At this point, the plenary session was adjourned and the four CGMS Working Groups conducted their business over the next two days.

Following the resumption of the Plenary session on Thursday 6 October 2011, Prof. Vasily Asmus, Director of FSBI SRC PLANETA, welcomed the participants to CGMS-39. He expressed his sincere thanks to Mr Alain Ratier, Director-General of EUMETSAT and the CGMS Secretariat for their support in organising the meeting in the Russian Federation in close cooperation with ROSHYDROMET and SRC Planeta.

He was pleased that this event provided ROSHYDROMET with a valuable opportunity to contribute to CGMS endeavours.

He concluded by iterating that it was an honour for him to host CGMS-39 and wished the participants a fruitful meeting.

A.2 Election of Chairmen

Prof Prof. Vasily Asmus, Director of FSBI SRC PLANETA, was unanimously elected as Chairperson of CGMS-39, together with Mr Alain Ratier, Director-General of EUMETSAT and the CGMS Secretariat as Rapporteur. The Plenary session confirmed the Chairpersons for the four Working Groups elected in the previous CGMS meeting, namely: Mr Marlin O Perkins, NOAA, for Working Group I on Telecommunications, with Mr Joaquin Gonzalez, EUMETSAT, as Rapporteur; Prof Vasily Asmus for Working Group II on Satellite Products together with Dr Vaddi Rajeswara Rao, IMD, with Dr Mitch Goldberg, NOAA, and Dr Johannes Schmetz, EUMETSAT as Rapporteurs; Mrs Suzanne Hilding, NOAA, for Working Group III on Contingency Planning with Mr Jerôme Lafeuille, WMO, as Rapporteur; and Mr Mikael Rattenborg, EUMETSAT, as Chairperson of Working Group IV on Global Data Dissemination, with Mr Gordon Bridge, EUMETSAT, as Rapporteur.

A.3 Adoption of Schedule

CGMS-39 adopted the schedule and agreed that the four Working Groups would meet on 3-4 October 2011.

The Secretariat provided a draft agenda (see Annex 1), which was used as a basis for the subsequent discussions together with the list of working papers submitted to CGMS-39 (see Annex 2).

A.4 Nomination of Drafting Committee

The Drafting Committee was nominated, consisting of the Chairpersons of CGMS-39, its Rapporteurs, the Chairpersons of the Working Groups and their Rapporteurs, and the CGMS Secretariat.

The drafting of various sections of the final meeting report was carried out by the CGMS Secretariat with the assistance of CGMS participants, based upon summaries of submitted working papers and reports of the Working Groups and plenary sessions.

A.5 Review of Actions Items from the Previous Meetings

The Secretariat reviewed the outstanding actions from previous meetings, taking into account inputs provided in Working Papers by the Members, as well as by other means of correspondence, including e-mail. Related Working Papers: CMA-WP-01, CMA-WP-02, ESA-WP-04, EUM-WP-01/-02, JMA-WP-01, KMA-WP-01, NOAA-WP-01, ROSC-WP-01, ROSH-01.

Status of Actions and Recommendations resulting from CGMS-38 (as per 21 OCTOBER 2011)

Actions open from CGMS-37 (at CGMS-38)					
Actionee	**Action**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**
ROSHYDROMET	37.01	Action 37.01: ROSHYDROMET to inform CGMS about the availability of Meteor-M calibration data. Deadline: CGMS-39	GSCICS Meeting, report in progress	(CGMS-38) New Deadline: CGMS-39	CLOSED
ESA	37.04	Action 37.04: ESA to inform CGMS whether the soil moisture information derived from SMOS data is comparable to that derived from Scatterometer data. Deadline: CGMS-39	CGMS-ESA-WP-04 presented to Plenary	(CGMS-38) New Deadline: CGMS-39	CLOSED
VL Co-chairs	37.12	Action 37.12: VL Co-chairs to discuss with VL sponsoring agencies the funding of the Technical Support Officer (TSO) position from the end of 2010 onwards. Deadline: CGMS-39 (from the end of 2011 onwards)		(CGMS-38) New Deadline: CGMS-39	CLOSED
VL Co-chairs	37.13	Action 37.13: VL Co-chairs and WMO to convene the fifth Virtual Laboratory Management Group (VLMG-5) meeting during the first half of 2010. Deadline: CGMS-39		(CGMS-38) New Deadline: CGMS-39	CLOSED
WMO	37.14	Action 37.14: WMO to continue dialogue with ISRO regarding the establishment of an Indian CoE and the co-sponsoring of the CoE in Oman. Deadline: CGMS-39	CGMS-39 WMO-WP-14; CGMS-3-9 NOAA-13 On going	(CGMS-38) New Deadline: CGMS-39	OPEN
WMO + VL Co-chairs	37.15	Action 37.15: VL Co-chairs and WMO to seek an agreement between CGMS, COMET and WMO with a view of using the ESRC as a resource library for the VL. Deadline: CGMS-39		(CGMS-38) New Deadline: CGMS-39	CLOSED
WMO + VL Co-chairs	37.16	Action 37.16: The Co-chairs, in consultation with the WMO Space Programme and other relevant WMO Departments, to prepare a roadmap towards widening the scope of VL activities to serve the needs of emerging scientific communities in developing countries. This roadmap will be reviewed by the VLMG and presented to CGMS-38 for approval. Deadline: CGMS-39	NOAA-WP-14 PLENARY 29/09/2011WMO-WP-14 refers.	(CGMS-38) New Deadline: CGMS-39	CLOSED
CGMS Members	37.17	Action 37.17: CGMS Members to complete the tables of data access information, and to provide the relevant internet links to WMO. Deadline: CGMS-39	EUM-WP-36; NOAA responded via email. PLENARY	(CGMS-38) New Deadline: CGMS-39	CLOSED
ESA	WGII 37.28	Action 37.28: ESA to provide a working paper on the long-term monitoring of MERIS as a reference calibration instrument. Deadline: CGMS-39	Paper in Preparation, will be delivered in 02/2012, new deadline CGMS-40	(CGMS-38) New Deadline: CGMS-39	OPEN

CGMS-38 permanent actions					
Actionee	**Action**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**
CGMS satellite operators	WGIV 37.37	Action 37.37: All CGMS satellite operators to regularly include user statistics in their reports on current satellite systems. Deadline: CGMS-39	NOAA is actively investigating methods to include user statistics when reporting on current satellite systems. 14/01: to be closed at CGMS-39, will report via the Permanent Action number 06	(CGMS-38) New Deadline: CGMS-39	CLOSED
CGMS Members	Permanent 01	All CGMS Members to inform the Secretariat of any change in the status or plans of their satellites to allow the updating of the CGMS Tables e-mail, of Satellites (tables 1-6 of the plenary report). The Secretariat to review the tables of current and planned polar and geostationary satellites and to distribute this updated information, via the WWW Operational Newsletter, via Electronic Bulletin Board, or other means as appropriate. CGMS satellite operators to update table 7 for polar-orbiting satellite equator crossing times on an annual basis. CGMS Members to update the table on polar-orbiting satellite equator crossing times as well as the table on coverage from geostationary satellites.	EUM-WP-02, NOAA-WP-02, -03, -04, -07, -08, -19, -35, -40, -43	CGMS-38	OPEN
CGMS satellite operators	Permanent 02	CGMS Members to report on spacecraft anomalies from solar events at CGMS meetings.	EUM-WP-05, NOAA-WP-05	CGMS-38	OPEN
CGMS Members	Permanent 03	CGMS Members to review the list of available list servers used by CGMS groups and update as appropriate.	Ongoing	CGMS-38	OPEN
CGMS Members	Permanent 04	CGMS satellite operators to consider the IOC satellite requirements, especially the data dissemination methods, bearing in mind the ongoing formations of GOOS Regional Alliances (GRAs).	EUM-WP-16, NOAA responded at CGMS XXXV, no update at this time.	CGMS-38	OPEN
CGMS Members	Permanent 05	CGMS should develop a coordinated approach for direct broadcast services of future polar orbiting meteorological satellite systems.		CGMS-39	OPEN
CGMS Members	Permanent 06	All CGMS satellite operators to regularly include user statistics in their reports on current satellite systems. Deadline: CGMS-39.		CGMS-39	OPEN

CGMS-38 actions					
Actionee	**Action**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**
EUM	38.01	Action 38.01: EUMETSAT to report on availability of IASI Level-2 product extraction software for direct readout. CGMS-39	Closed at CGMS-39	CGMS-39	CLOSED
ROSH	38.02	Action 38.02: Roshydromet to make technical details of microwave Sounder data (meta-data, format) available to the global user community. Deadline: 31 March 2011.	Closed at CGMS-39	31-Mar-11	CLOSED
CGMS Members	38.03	Action 38.03: CGMS Members to report on their activities related to Space Debris / collision mitigation measures by CGMS-39.	CGMS-39 EUM -WP-12 CGMS-39 NOAA-WP-06	CGMS-39	CLOSED

CGMS-38 actions					
Actionee	**Action**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**
CGMS Members	38.04	Action 38.04: CGMS Members to provide information on anomalies affecting their spacecrafts and payload caused by cosmic radiation. Deadline: CGMS-39	CGMS-39NOAA-WP-05,CGMS-39 EUM-WP-05	CGMS-39	CLOSED
CGMS Members	38.05	Action 38.05: CGMS Members to provide written recommendation to WMO on its proposal to develop a space-based architecture for climate monitoring by 15 December 2010.	15/12/10: NOAA: answer not ready yet. Email sent to Barbara Ryan WMO from EUM/DG on 03/01/2011	15-Dec-10	CLOSED
CGMS Secretariat	38.06	Action 38.06: CGMS Secretariat is invited to send a letter from CGMS Members to the WMO SG asking to reinstate a discussion on the WMO Space Program at the next WMO Congress in 2011.	03/12/2010: Letter EUM/SIR/LET/10/0751 was sent out to Michel Jarraud, WMO.	15-Dec-10	CLOSED
CGMS Satellite Operators	38.07	Action 38.07: CGMS Satellite Operators are encouraged to note the usefulness of RA II Pilot Project web pages on the WMO Space Programme (WMOSP) website providing information related meteorological satellites for NMHSs users, and to support the Project providing the information of satellite data and products answering to the questionnaire, which will be sent from the project co-coordinators.	KMA Email 9/12/2010 KMA-WP-20/JMA-WP-07 outlined the background and mission of the Pilot Project to develop support for NMHSs in satellite data, products and training along with the accomplishments of the first phase and the action plan for the second phase. WMO thanked KMA for this initiative. 29/09/2011: WMO JMA-WP-06 refers.	CGMS-39	CLOSED
CGMS Members	38.08	Action 38.08: CGMS Members are invited to participate in the First Workshop on Space-based Architecture for Climate, focussing on “Continuity and architecture requirements for climate monitoring”, to be held on 13 and 14 January 2011 in Geneva. Comments on Workshop outline to be received by to WMO by 1.12.2010	Reminder sent 07/12/2010, 08/12/2010 sent EUM letter to Jérôme Lafeuille by email, JMA said would send the letter soon 09/12 /JMA answered 17/12/10 / EUM Response to Caroline Richter and Barbara Ryan EUM/SIR/LET/10/0741 sent 2/12/2010.	01-Dec-10	CLOSED
WMO	38.09	Action 38.09: WMO SP to check with the GEO SEC the possibility to co-sponsor the Workshop. Deadline: January 2011.	sent an email to Jérôme Lafeuille on 23/02 // email sent on 02/03/2011	31-Jan-11	CLOSED
CGMS Members	38.10	Action 38.10: CGMS Members are invited to support the Global Cryosphere Watch (GCW) by identifying relevant operational satellite products, and developing new satellite derived climate products, which would contribute to GCW and to comment on the benefit of cryosphere reference sites that meet long-term in-situ needs as well as satellite cal/val needs.	CGMS-39-WP-12, CGMS-39-WMO-WP-10	CGMS-39	CLOSED
WMO / CGMS Virtual Laboratory Management Group (VLMG)	38.11	Action 38.11: The WMO / CGMS Virtual Laboratory Management Group (VLMG) to liaise with the SWFDP to identify opportunities to coordinate training activities and share training resources that would allow Member countries in SWFDP project regions, such as Southern and Eastern Africa, South-eastern Asia and the Southern Pacific, to further enhance the benefits realised through the SWFDP in better using satellite-based products in support of severe weather forecasting.	29/09/2011 WMO: On-going, see WMO-WP-05 and 21 Treated in the working Groups	CGMS-39	CLOSED

CGMS-38 actions					
Actionee	**Action**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**
CGMS Satellite Operators	38.12	Action 38.12: CGMS Satellite Operators to provide a contact point for Severe Weather Forecasting Demonstration Project (SWFDP), who would contribute to inform the SWFDP project on relevant satellite data and products responding to SWFDP needs, and to identify opportunities for development of improved products and services. Deadline: CGMS-39.	29/09/2011: WMO: Proposed new action in WMO-WP-05, WMO received from NOAA WP-12, WP-05	CGMS-39	CLOSED
CGMS Members	38.13	Action 38.13: CGMS members to respond to the updated set of GCOS needs, through the proposed space-based architecture for climate monitoring and the CEOS response (cf. CGMS-38 NOAA-WP-13), as appropriate.	14/01/11: action closed after the WMO workshop	CGMS-39	CLOSED
CGMS Members	38.14	Action 38.14: CGMS Members are invited to nominate further representatives for the web committee and send it to cgmssec@ eumetsat.int. The CGMS Secretariat will be the point of contact. The committee to receive comments/feedback/ suggestions on the website.	26/01/2011: email send to close the action	31-Dec-10	CLOSED
CGMS Members	WGI 38.15	Action 38.15: CGMS Members to provide to each CGMS meeting a list of frequencies used by their current and future systems in the format provided in WG I report (Annex 1) (merged version of WMO frequency reports amended with the extra fields as provided in Tables 1 and 2 of Document CGMS-38 EUM-WP-23). Deadline: CGMS-39		CGMS-39	CLOSED
CGMS Members	WGI 38.16	Action 38.16: CGMS members to provide to the CGMS Secretariat and IMD their operational and planned use of the data collection service (regional and international) that contains or overlap the band 402.25-402.65 in a format as provided in Annex 1 of this WG I report. Deadline: 15 December 2010 at the latest.	15/10/2010: JMA sent an answer in form of a satellite table. 15/12/2010 “NOAA has no plans to use the band 402.25-402.65.” email from Derek Hanson, NOAA, sent to EUM/H/SES 12/01/11 14/01/11: reminder sent to Cgmsplen. If no input by 21/01 we will close the action. 14/01/11: EUM considers this action closed, to be closed at CGMS-39	15-Dec-10	CLOSED

CGMS-38 actions					
Actionee	**Action**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**
CGMS Members	WGI 38.17	Action 38.17: Concerning US public enquire for sharing with 4G mobile systems of the 1675-1710 MHz band CGMS members are encouraged to provide CGMS secretariat their inputs and position regarding the impact on their current and future systems (or a more general copy of the letters submitted in response of the US public enquire). Deadline: 1 December 2010.	Received input from WMO on 03/12/2010 15/12/10 input from JMA as follow: The Japan Meteorological Agency (JMA) has been operating the Japanese geostationary MetSat, the GMS series and MTSAT series, around 140°east longitude covering for the East Asia and Western Pacific regions since 1977 and contributing to the WMO's World Weather Watch (WWW) Programme. Currently, the MTSAT series satellites, MTSAT-1R and MTSAT-2, use the frequency band of 1675-1710 MHz for downlink in operation. For that reason, JMA would like to express that it is necessary to protect the existing assignment 1675-1710 MHz frequency band to MetSat. JMA also considers that it is very important to continue to exchange information related to this frequency issue among the CGMS members. 26/01/2011: Action closed by email.	01-Dec-10	CLOSED
CGMS Secretariat	WGI 38.18	Action 38.18: CGMS Secretariat to draft a letter to the appropriate US officials to address the concern of the WMO and CGMS members and the implications on their systems and services based on the shared use of this band by 4G mobile systems. Deadline: 15 December 2010.	Letter sent 5/01/2011 REF EUM/SIR/Let/11/0005 and D22UM/SIR/LET/10/0798 US Secretary Locke to all CGMS Plen + heads of delegations // Response from the USA Dpt of Commerce: letter dated 4/02/2011 reference	15-Dec-10	CLOSED
NOAA	WGII 38.19	Action 38.19: NOAA to report on progress towards using SSMIS to extend the SSMI records on total precipitable water. Deadline: CGMS-39		CGMS-39	CLOSED
CGMS Agencies	WGII 38.20	Action 38.20: CGMS agencies to provide reports on satellite calibration anomalies Deadline: CGMS-39.		CGMS-39	CLOSED
NOAA	WGII 38.21	Action 38.21: NOAA to submit the current version of the AVHRR Fundamental Climate Data Record for GSICS Product Acceptance.		CGMS-39	CLOSED
EUM	WG II 38.22	Action 38.22: EUMETSAT to provide to CGMS agencies information on the EUM Convection Working Group. Deadline: 28 February 2011.	mail sent out to CGMS	28-Feb-11	CLOSED
ITWG rapporteur	WG II 38.23	Action 38.23: ITWG rapporteur will provide actions related to calibration to GSICS. Deadline: 28 February 2011.	Reminder sent to Mitch Goldberg NOSA 23/02/11, Email back from Derek on 28/03/11: no answer yet. 29/04 FUP with Derek, FUP 20/06/2011	28-Feb-11	CLOSED
ITWG rapporteur	WGII 38.24	Action 38.24: ITWG rapporteur will provide actions related to climate to SCOPE-CM. Deadline: 28 February 2011.	Reminder sent to Mitch Goldberg NOSA 23/02/11, Email back from Derek on 28/03/11: no answer yet. 29/04 FUP with Derek, FUP 20/06/2011	28-Feb-11	CLOSED

CGMS-38 actions					
Actionee	**Action**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**
ITWG rapporteur and ITWG co-chairs	WGII 38.25	Action 38.25: ITWG rapporteur and ITWG co-chairs to invite IMD and ISRO to consider participation in ITWG. Deadline: 28 February 2011.	Reminder sent to Mitch Goldberg NOSA 23/02/11, Email back from Derek on 28/03/11: no answer yet. 29/04 FUP with Derek, FUP 20/06/2011	28-Feb-11	CLOSED
EUM and NOAA	WGII 38.26	Action 38.26: Recognising limited validation data-sets and the use of SEVIRI for GOES-R and MTG algorithm development, EUMETSAT and NOAA to coordinate with South Africa for creation of validation data-sets for rainfall products and to report at CGMS 39.		CGMS-39	CLOSED
All Satellites Operators	WGII 38.27	Action 38.27: All satellite operators are invited to inform the CGMS Secretariat whether they will support a second AMV intercomparison study. They are also invited to provide feedback on potential improvements and changes (due date 31 March 2011).	EUMETSAT will support a second study// NOAA will also support a second study. Email from Derek NOAA 05/04/2011. 17/05/11: CMA, KMA and Roshydromet. 18/05 JMA confirmed they will support the study	31-Mar-11	CLOSED
Co-chairs of the IWWG	WGII 38.28	Action 38.28: Co-chairs of the IWWG should develop a workplan for a second AMV intercomparison study on the basis of lessons-learnt from the 1st intercomparison and the pertinent feedback and comments provided by CGMS members. Deadline: CGMS-39		CGMS-39	CLOSED
EUM	WGII 38.29	Action 38.29: EUMETSAT to conduct an extended validation campaign for AMVs derived with the NWCSAF portable AMV software package. Deadline: 31 May 2011 and a report to CGMS-39.	sent email to Régis Borde on 29/04 Answer sent on 30/05/2011	31-May-11	CLOSED
WMO	WGII 38.30	Action 38.30: WMO to coordinate efforts between operational data providers and NWP agencies to establish long term continuity plans, including the use of research data in operational products and optimal configurations for climate applications. Deadline: CGMS-39.	29/09/2011: WMO: This is a long-term action, initiated through participation in NAEDEX-APSDEU meetings (See WMO-WP-26) Will convert in a permanent action	CGMS-39	CLOSED
CGMS Satellite Operators	WGII 38.31	Action 38.31: CGMS Satellite Operators are invited to report on a regular basis on their capabilities and plans to support volcanic ash monitoring, including the development of relevant products and techniques for utilisation, in order to inform the relevant ICAO and WMO bodies: the WMO/IUGG Volcanic Ash Scientific Advisory Group and the ICAO International Volcanic Ash Task Force/International Airways Volcanic Watch Operations Group (IVATF/IAVWOPSG).		CGMS-39	CLOSED
CMA, IMD, NOAA, and other interested CGMS agencies	WGII 38.32	Action 38.32: Propose CMA, IMD, NOAA, and other interested CGMS agencies to support future training related to the use of satellites to monitor dust, volcanic ash, fog, and forest fires in conjunction with the WMO Virtual Laboratory. Deadline: CGMS-39.		CGMS-39	CLOSED

CGMS-38 actions					
Actionee	**Action**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**
CGMS operators	WGII 38.33	Action 38.33: Invite CGMS operators to submit to the next CGMS meeting Working Papers on nowcasting applications, including cloud analysis, fog detection and forest fires. Deadline: CGMS-39.		CGMS-39	CLOSED
IOC	WGII 38.34	Action 38.34: IOC to provide a paper on guidance to CGMS members to improve sea surface temperature measurements. Deadline: CGMS-39.		CGMS-39	CLOSED
CMA	WGII 38.35	Action 38.35: CMA is invited to provide more detailed intercomparisons of FY-3A ERB with CERES.		CGMS-39	CLOSED
NOAA and IMD	WGII 38.36	Action 38.36: NOAA and IMD to better understand differences in TC intensity estimations and to inform CGMS members on the outcome. Deadline: CGMS-39.	New deadline CGMS-40	CGMS-39	OPEN
WMO	WGIII 38.37	Action 38.37: WMO to report on the outcome of the Workshop on Continuity and Architecture Requirements for Climate Monitoring, at CGMS-39 (Due date: CGMS-39).	29/09/2011 WMO: See WMO-WP-24	CGMS-39	CLOSED
CGMS Satellite Operators	WGIII 38.38	Action 38.38: CGMS satellite operators to report at CGMS-39 on their user-preparation activities for the next generation geostationary satellite series.	to be closed at Plenary, pending report to plenary under C.2	CGMS-39	CLOSED
WMO	WGIII 38.39	Action 38.39: WMO with the support of the relevant Expert Teams, to prepare an update of the baseline for the space-based component of the Global Observing System along the lines of Annex 3 to the report of CGMS-38 WG III, and circulate to CGMS Members in advance of CGMS-39.	29/09/2011 WMO-WP-02	CGMS-39	CLOSED
WMO	WGIII 38.40	Action 38.40: WMO in collaboration with the atmospheric composition community and satellite experts to further refine the requirements for atmospheric composition requirements and the optimal way to address these in the revised baseline.	29/09/2011 WMO: ongoing, see WMO-WP-09	CGMS-39	OPEN
CGMS Satellite Operators	WGIII 38.41	Action 38.41: CGMS Satellite Operators to confirm their commitments to contribute to the updated baseline for the space-based component of the Global Observing System (Due date: CGMS-39).	proposed for closure at Plenary, after report of WGIII , closed at plenary	CGMS-39	CLOSED
WMO	WGIII 38.42	Action 38.42: WMO to take into account the revised CGMS baseline for the space-based component of the GOS in the updating process of relevant WMO Manuals and Guides, with a view of its endorsement by CBS-XV in 2012.	Shall be completed, based on the outcome of CGMS-39, will start after plenary	CGMS-39	OPEN
CGMS Members	WGIII 38.43	Action 38.43: CGMS Members to review the Draft Mapping of the gap analysis with the GCOS ECVs, and provide comments to WMO (Dr Bizzarro Bizzarri, bibizzar@tin.it) to be considered for a revised version to be submitted to the “Workshop on Continuity and Architecture Requirements for Climate Monitoring” on 13-14 January 2011. (Deadline: 15 December 2010.)	Action closed with the email of Jérôme Lafeuille 13/01	15-Dec-10	CLOSED

CGMS-38 actions					
Actionee	**Action**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**
NOAA	WGIV 38.44	Action 38.44: NOAA to provide a report to CGMS on its planning for the transition of users from the current GOES system to GOES-R. Deadline CGMS 39.	Discussed at CGMS 39 Working Group IV/2	CGMS-39	CLOSED
EUM	WGIV 38.45	Action 38.45: EUMETSAT to provide CGMS with more detailed information and the schedule of implementation for the various MTG data dissemination schemes. Deadline CGMS39.	Discussed at CGMS 39 Working Group IV/2	CGMS-39	CLOSED
CGMS Satellite Operators	WGIV 38.46	Action 38.46: CGMS satellite operators to inform CGMS on progress towards the achievement of future broadcast services (physical layers, formats, etc.) in the timeframe of the EPS-SG and JPSS satellites. Deadline CGMS 39.	Discussed at CGMS 39 Working Group IV/2	CGMS-39	CLOSED
NOAA and EUM	WGIV 38.47	Action 38.47: NOAA and EUMETSAT to present a description of joint broadcast services for EPS-SG and JPSS. Deadline CGMS 39.	Discussed at CGMS 39 Working Group IV/2	CGMS-39	CLOSED
CGMS Satellite Operators	WGIV 38.48	Action 38.48: CGMS satellite operators to inform CGMS on efforts to widen user access and to establish and respond to user requirements with GEONETCast. Deadline CGMS 39.	Discussed at CGMS 39 Working Group IV/3	CGMS-39	CLOSED
CGMS Members	WGIV 38.49	Action 38.49: GMS members to report on their measures and plans regarding interoperability and standardised online data access for archived data-sets. Deadline CGMS-39.	Discussed at CGMS 39 Working Group IV/5 and IV/6	CGMS-39	CLOSED
CGMS Members	WGIV 38.50	Action 38.50 CGMS members are invited to report on the current measures taken in their Organisation for the long-term preservation of data and indicate if a future harmonised approach (e.g. common guidelines) would be helpful. Deadline CGMS-39.	Discussed at CGMS 39 Working Group IV/5	CGMS-39	CLOSED
CGMS Members	WGIV 38.51	Action 38.51: CGMS Members to verify if they have been registered as a part of WIS, in particular as Data Collection or Production Centres (DCPCs) or National Centres (NCs).	14/01/2011: EUM considers that action closed Discussed at CGMS 39 Working Group IV/6 IMD to clarify its position	CGMS-39	CLOSED
Candidate DCPCs or NCs	WGIV 38.52	Action 38.52: Candidate DCPCs or NCs to review the WIS specifications to ensure they are able to support the relevant WIS interfaces, including ensuring metadata describing their products and services is available in WMO format (ISO19115) for uploading to a Global Information System Centre (GISC).	29/09/2011: WMO: See WMO-WP-27 Discussed at CGMS 39 Working Group IV/6	CGMS-39	CLOSED
IMD and KMA	WGIV 38.53	Action 38.53: IMD and KMA are invited to nominate experts to the WMO/CGMS Task Force on Satellite Data Codes. Deadline end January 2011.	Reminder sent on 13/01/2011: to KMA and IMD, cc J Lafeuille Answer 31/01/11: KMA nominated 2 experts closed for KMA and IMD to clarify its position.	31-Jan-11	CLOSED
CGMS Members	Recommendation 38.01	Recommendation 38.01: CGMS recommended to consider the possibility to extend the IODC coverage after 2013 and after the end of life of Meteosat-7.		CGMS-39	CLOSED

CGMS-38 actions					
Actionee	**Action**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**
CGMS Members	Recommendation 38.02	Recommendation 38.02: CGMS members to examine opportunities to incorporate Severe Weather Forecasting Demonstration Project (SWFDP) required data and products in their broadcast schemes.		CGMS-39	CLOSED
CGMS Members	Recommendation 38.03	Recommendation 38.03: CGMS members to consider ways and means to strengthen their support to international scientific expert teams involved in peer review of climate data records (for example, to the CGMS Working Groups IPWG, IWWG, ITWG and IROWG, and to the World Climate Research Programme Global Energy and Water Cycle Experiment Radiation Panel (WCRP GEWEX RP)).		CGMS-39	CLOSED

CGMS-38 recommendations					
Actionee	**Recommendation**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**
CGMS satellite operators	Recommendation 38.04	Recommendation 38.04: CGMS Satellite Operators are invited to consider the development of new operational sensors for cryospheric variables, especially snowfall.		CGMS-39	CLOSED
CGMS Members	Recommendation 38.05 WGI	Recommendation 38.05: CGMS members are invited to provide information on the planned use of the band 7750 - 7850/7900 MHz in order to facilitate an early coordination of this band among MetSat operators in the framework of SFCG.		CGMS-39	CLOSED
CGMS Members	Recommendation 38.06 WGI	Recommendation 38.06: When planning frequency use of current and future DCS systems, CGMS members are encouraged to adhere to the content of Resolution SFCG 30-1 providing the basic general partitioning of the band 401 – 403 MHz and related sharing conditions for future long-term coordinated use of DCS systems on geostationary and non-geostationary MetSat and EESS systems. If considered necessary, further coordination within the selected sub-bands should be initiated and performed within the framework of SFCG.		CGMS-39	CLOSED
CGMS Members	Recommendation 38.07 WGI	Recommendation 38.07: CGMS members planning to use the 7750-7900 MHz band investigate using the CGMS global standards for AHRPT.		CGMS-39	CLOSED
NOAA	Recommendation 38.08 WGII	Recommendation 38.08: NOAA to consider sharing 1 minute simulated imagery upon request from CGMS agencies planning new advanced imagers in geostationary orbit.		CGMS-39	CLOSED
CMA	Recommendation 38.09 WGII	Recommendation 38.09: CMA to provide both short and long term time-series of the Qinghai and Dunhuang sites using geostationary satellites to evaluate the diurnal variation of the lake temperature and the BRDF of the Dunhuang site.		CGMS-39	CLOSED
CGMS-38 recommendations					

Actionee	Recommendation	Description	Action feedback/closing document	Deadline	Status
CMA	Recommendation 38.10 WGII	Recommendation 38.10: CMA to consider the use of in-situ radiometers to routinely measure the Qinghai Lake surface temperature for improved accuracy.		CGMS-39	CLOSED
NOAA	Recommendation 38.11 WGII	Recommendation 38.11: NOAA to publish results on the characteristics of targets for vicarious calibration presented in NOAA-WP-26.		CGMS-39	CLOSED
NOAA	Recommendation 38.12 WGII	Recommendation 38.12: NOAA to use GPS RO measurements to assess the systematic bias remaining in the MSU/AMSU intercalibrated FCDRs.		CGMS-39	CLOSED
NOAA	Recommendation 38.13 WGII	Recommendation 38.13: NOAA to present results on the Stratospheric Sounding Unit (SSU) intercalibration and derived long term trends and comparisons with trends from MSU/AMSU.		CGMS-39	CLOSED
JMA	Recommendation 38.14 WGII	Recommendation 38.14: JMA is invited to report on the use of high resolution AMV derived for T-PARC experiment.		CGMS-39	CLOSED
CGMS Operators	Recommendation 38.15 WGII	Recommendation 38.15: CGMS operators are invited to express their interest in the portable AMV software package from the EUMETSAT 'Nowcasting SAF' for testing and internal comparisons.		CGMS-39	CLOSED
ISRO and partner Agencies	Recommendation 38.16 WGII	Recommendation 38.16: ISRO and partner Agencies to provide ROSA GPS RO data from Oceansat-2 and Megha-Tropiques to operational agencies in near real-time.		CGMS-39	CLOSED
CGMS satellite operators	Recommendation 38.17 WGIII	Recommendation 38.17: Once their operational requirements are fully satisfied, CGMS Satellite Operators should consider redeployment towards less covered areas if need arises, taking advantage of available in-orbit capacity in geostationary orbit.		CGMS-39	CLOSED
CGMS satellite operators	Recommendation 38.18 WGIII	Recommendation 38.18: CGMS Satellite Operators implementing new systems should provide the user community, as early as possible, with full technical details needed by users to get prepared to access and use these systems.		CGMS-39	CLOSED
CGMS Members	Recommendation 38.19 WGIII	Recommendation 38.19: Orbital planes of operational sun-synchronous satellites with sounding capability (IR and MW) should be coordinated with a view to optimise the temporal distribution in order to maximise coverage.		CGMS-39	CLOSED
CGMS Members	Recommendation 38.20 WGIII	Recommendation 38.20: The WG recommended to proceed with an update of the CGMS baseline for GEO, LEO and HEO satellites in advance of CBS-XV in 2012, describing the target configuration for 2015.	WMO ACTION	CGMS-39	CLOSED
CGMS Members	Recommendation 38.21 WGIII	Recommendation 38.21: CGMS to keep under review the baseline for GEO, LEO and HEO satellites for 2015 with the aim to ensure, by 2025, a full implementation of the WMO Vision for the GOS in 2025.	LONG TERM	CGMS-39	CLOSED

B. REPORT ON THE STATUS OF CURRENT SATELLITE SYSTEMS

B.1 Polar-Orbiting Meteorological Satellite Systems

CMA-WP-03 reported on the status of the Chinese polar orbiting meteorological satellite program. The program produced 4 satellites, namely FY-1A/B/C/D, all sun-synchronous, 3-axis stabilised; carrying the Multi-channel Visible and Infrared Scanning Radiometer (VIRR) for earth environment monitoring where at sub-satellite point the resolution is 1.1km; and the Space Environment Monitor (SEM) for in-situ observation of charged particles in the solar wind. A Direct Readout Service is available through an HRPT transmission. After having been flying in orbit for 9 years, FY-1D is entering the end of its life. In May 2011, its operation was disrupted due to the power supply that had become too weak to keep a stable attitude of the satellite. If this situation remains without improvement, official declaration of the end of the FY-1D mission is possible in September, and it will mark the end of the FY-1 Program.

The CMA FY-3 program has been implemented to follow on from the FY-1 programme. According to the program, 7 satellites will be launched to cover the period from 2008-2021. The first satellite, FY-3A, was launched on 27 May 2008. It is a 3-axis stabilised, sun-synchronous satellite with a LST of 10:15am, and the onboard instruments include the multi-channel Visible and Infrared Scanning Radiometer that flies on the FY-1 series of satellites, and the Medium Resolution Spectral Imager (MERIS), the Microwave Radiation Imager (MWRI) and the IR and MW sounders, the Total Ozone Unit and the Solar Backscatter Ultraviolet Sounder (TOU/SBUS), as well as an Earth Radiation Budget instrument. FY-3 transmits data in three modes: L-band AHRPT, X-band MPT, and DPT. The Direct Readout Service of AHRPT is provided globally.

The FY-3B satellite, which is identical to FY-1A, was launched in November 2010. The satellite is designed for a lifetime of 3 years. The LST is 1:38pm as of 26 August 2011.

EUMETSAT thanked CMA for making the sounding data globally available. WMO also thanked CMA for making the pre-processing software of the sounding data available to the global community.

The status of the EUMETSAT Polar System (EPS), as of September 2011, was provided in **EUM-WP-03**. This covered Metop-A, the EPS ground segment and the EPS service performance (global and regional services).

The paper also included the status and progress reports of on-going projects, covering the Metop-B preparations, the completion of the implementation of the improvement of global timeliness, the extension of EARS, as well as the evolution of the regional and global NPP service implementation.

For the very first time, in January 2011, Metop-A live data has been received from the McMurdo Ground Station (MG-1) as part of the Antarctic Data Acquisition (ADA) project.

This achievement will begin the process of improving the timeliness of products delivered to the end-users - from 135 to just 65 minutes – a development that will benefit global operational weather forecasting and disaster monitoring.

EARS provides users with quick-access to data from the Metop and NOAA satellites from a network of local reception stations. The data provided by EARS include image data, sounder data and scatterometer data, primarily in support of Numerical Weather Prediction (NWP) and Nowcasting at the National Meteorological Services.

JMA thanked EUMETSAT for the extension of HRTP coverage and expressed the hope that it would continue for Metop-B. This was confirmed by EUMETSAT.

NOAA-WP-02/04, in addition to a report on the constellation of the four geostationary satellites, gave a report on the eleven polar orbiting meteorological spacecraft, including six military satellites, from the Satellite Operations Control Center (SOCC) in Suitland, Maryland. These satellites provide continuous observations of weather conditions and environmental features of the western hemisphere, monitor global climate change, verify ozone depletion and land surface change, monitor the critical space environmental parameters, and support search and rescue efforts across the globe. This document briefly addresses the status of the geosynchronous and low-earth-orbiting spacecraft constellations as of 31 August 2011.

NOAA-19 was launched 6 February 2009. Declared operational on 2 June 2009, NOAA-19 replaced NOAA-18 as the Primary afternoon spacecraft for IJPS. NOAA-19 operates in an orbit with a 1:32 PM ascending node (afternoon orbit) at an altitude of 870km, functioning nominally.

NOAA-18 was launched on 20 May 20 2005. As of 30 August 2005, NOAA-18 was designated operational. NOAA-18 operates in an orbit with a 1:22 PM ascending node (afternoon orbit) and utilises the Microwave Humidity Sounder (MHS) and the Solar Backscatter Ultraviolet Spectral Radiometer (SBUV).

NOAA-17 was launched on 24 June 2002 and became operational on October 15, 2002. With the successful launch and checkout of METOP-A, NOAA-17 now supports the mid-morning mission as a backup spacecraft, but is drifted to the 20:01 ascending node (morning orbit).

NOAA-16 was launched on 21 September 2000. On 30 August 2005, it was designated a secondary afternoon spacecraft with a 19:44 PM ascending node (afternoon orbit).

NOAA-15 was launched on 13 May 1998 and became operational on July 1998. As of 15 October 2003, NOAA-15 was designated as a secondary spacecraft. As such, it operates in an orbit, but drifted to a 16:37 PM ascending node (morning orbit) and utilises the same set of instruments as NOAA-16 except for the SBUV.

ROSC/ROSH-WP-02 reported on the first of the Meteor-M series of new Russian polar-orbiting meteorological satellites. Meteor-M1 was successfully launched on 17 September 2009. The satellite is considered as experimental. The working paper contains the satellite payload description and status.

TABLE 1: CURRENT POLAR-ORBITING SATELLITES COORDINATED WITHIN CGMS

Sun-synchronous satellites are listed by Equatorial Crossing Time at the Ascending Node, in ascending order.

Orbit type	Satellites	Operator	ECT	Mean altitude	Launch date	Instrument payload and status
Sun-synchronous "Afternoon" orbit ECT between 12:00-17:00 and between 00:00-05:00	NOAA-19 (Op)	USA/NOAA	13:32	870 km	06/02/2009	Functional. Noise on MHS Channel H3. Noise on AMSU-A1 channel 8.
	FY-3B (Op)	CHINA/CMA	13:38	836 km	0511/2010	VIRR, MERSI-1, MWRI, IRAS, MWTS-1, MWHS-1, TOU/SBUS, SEM, SIM-1. AHRPT/MPT ERM failed
	NOAA-18 (B)	USA/NOAA	14:22	854 km	20/05/2005	Functional. Noise on HIRS long wave channels. SBUV chopper motor intermittent seizures, but self-corrected via macros. 6/7/2009 – MIMU-2 failure (loss of redundancy).
	DMSP-F14 (B)	USA/NOAA	15:47	852 km	Apr-97	Defence satellite. SSMI, SSMT1, SSMT2 non-functional. No functional on-board recorder
	FY-1D (Op)	China/CMA	16:18	866 km	15/05/2002	Functional. VIRR, SEM. Direct Broadcast CHRPT Expected end of service after 2010
	NOAA-15 (B)	USA/NOAA	16:38	807 km	May-98	Functional. AVHRR provides images with degraded navigation. AMSU-B scan motor stalled on March 28, 2011 & HIRS/Filter wheel failed on June 6, 2009) AMSU-A1 channels 11 & 14 inoperative and AMSU-B scan motor stalled on March 28, 2011.

ECT = Equator Crossing Time (for sun-synchronous orbits)
(P) = pre-operational
(Op) = Operational
(B) = Back-up, secondary
(L) = Limited availability

Orbit type	Satellites	Operator	ECT	Mean altitude	Launch date	Instrument payload and status
Sun-synchronous "Early morning" orbit ECT between 17:00-19:00 and between 05:00-07:00	DMSP-F15 (B)	USA/NOAA-DOD	17:06	850 km	12/12/1999	Defence satellite. SSMT2 non-functional. Reduced pointer accuracy. Data available to civilian users through NOAA.
	DMSP-F17 (Op)	USA/NOAA-DOD	17:37	850 km	04/11/2006	SSMIS . Defence satellite. Data available to civilian users through NOAA.
	DMSP-F13 (B)	USA/NOAA-DOD	18:05	850 km	Mar-95	SSMIS . Defence satellite. Data available to civilian users through NOAA. No functional recorders on board
	DMSP-F16 (B)	USA/NOAA-DOD	18:51	850 km	18/10/2003	SSMIS . Defence satellite. Reduced pointing accuracy. Data available to civilian users through NOAA.
Sun-synchronous "Morning" orbit ECT between 19:00-24:00 and between 07:00-12:00	NOAA-16 (B)	USA/NOAA	19:45	849 km	21/09/2000	Functional, no APT. Intermittent problems with AVHRR.
	DMSP F-18 (Op)	USA/NOAA-DOD	20:08	850 km	18/10/2009	SSMIS. Defence satellite. Data available to civilian users through NOAA.
	FY-3A (Op)	China/CMA	20:22	836 km	27/05/2008	Direct Broadcast: AHRPT/MPT AHRPT transmission of: VISR, MWTS, MWHS, TOU, SEM, SIM. MPT transmission of: MERSI SBUS, MWRI, ERM, IRAS failed
	NOAA-17 (B)	USA/NOAA	20:43	810 km	24/06/2002	Functional. 10/28/2003 – AMSU-A1 Failed. 2/15/2003 – DTR5 Failed. 2/14/2008 – STX3 output power degraded to inoperable level. STX1 diminished performance. AMSU-B channels 18-20 inoperative. AVHRR scan motor stalled on October 15, 2010.
	Metop-A (Op)	EUMETSAT	21:30	837 km	19/10/2006	AVHRR/3, HIRS/4, AMSU-A, MHS, IASI, GRAS, ASCAT, GOME-2, SEM (HRPT partly functional) Dissemination via EUMETCast
	METEOR-M1(P)	Russian Federation / Roshydromet-Roscosmos	21:30	830 km	17/09/2009	MSU-MR, MTVZA, KMSS, Severjanin, GGAK-M. Dissemination: HRPT, LRPT
Non sun-synchronous	Jason-2 (Op) (Ocean Surface Topography Mission) (NOAA, EUMETSAT)	NASA/NOAA/ EUMETSAT/ CNES	(66° inclin.)	1336 km	20/06/2008	Follow-on of Jason-1 Sea surface topography measurement

ECT = Equator Crossing Time (for sun-synchronous orbits)
(P) = pre-operational
(Op) = Operational
(B) = Back-up, secondary
(L) = Limited availability

B.2 Geostationary Meteorological Satellite Systems

CMA-WP-04 reported on the status of the current FY-2 geostationary programme. The programme has produced 5 satellites, FY-2A/B/C/D/E, each capable of S-VISSR imagery observation. Currently FY-2D and FY-2E are operationally active. FY-2D was launched on 15 November 2006 and it is positioned at 86.5E. FY-2E was launched on 23 December 2008 and it is positioned at 105E.

FY-2D and FY-2E alternatively observe and transmit S-VISSR images so that users can acquire an image every 15 minutes during the rainy season from June-September and every 30 minutes from October-May, by using two medium scale data utilization stations.

FY-2C has been moved to 123.5E since November 2009. In August 2011 it was activated again to transmit limited VISSR scanning images once every 10 minutes to Shen Zhen, the host city of the world university games.

The FY-2 Programme will continue. Plans for FY-2F/G/H have been approved. The capability of FY-2F/G/H is identical to that of FY-2C/D/E. The launch of FY-2F is planned for 2012. The design lifetime of each of the FY-2F/G/H satellites is 4 years.

EUM-WP-04 reported on the status of the Meteosat System from 1 July 2010 until 30 June 2011.

The operational status of the geostationary systems has been stable with Meteosat-7 at 57.5º East (Indian Ocean Data Collection - IODC), Meteosat-8 at 9.5º East (Rapid Scan Service - RSS) and Meteosat-9 at 0º (0º Service).

No significant in-flight anomalies have occurred on board the Meteosat satellites during the reporting period with the exception of a safe mode transition which occurred on Metesosat-8 on 30 July 2010, and the failure of a telemetry transmitter on board Meteosat-7.

It should be noted that Meteosat-6 was successfully removed from its orbit in April 2011.

The IODC service performance was nominal for the reporting period with monthly end-to-end availability figures above 99%.

The IODC DCP acquisition and dissemination service over the Indian Ocean was carried out by Met-7.

At the end of June 2011 there were 44 DCPs allocated and 40 of them remain active. The acquisition and dissemination of IODC DCPs was nominal during the reporting period.

JMA-WP-02 provided an update on the MTSAT system. MTSAT-2 (145°E) is now operational, imaging over the West Pacific region, and MTSAT-1R (140°E) serves as its backup. MTSAT-1R has continuously performed the services of MTSAT-2 imagery dissemination and data collection even since the switchover of the imaging function on 1st July 2010. The DCS (data collection system) of MTSAT-1R has been functioning properly since the satellite began operations.

In June 2011, JMA started MTSAT-1R small-sector observation around Japan at five-minute intervals during the daytime. The collected data are provided to aeronautical users in order to monitor severe weather conditions around airports and in airspace.

JMA was designated as the GISC for Tokyo, and MSC was selected as a DCPC at the 16th WMO Congress in May 2011. JMA officially started GISC and DCPC operations on 1 August 2011.

This document also outlined responses to CGMS Actions 38.15, 38.51 and 37.37.

KMA-WP-02 updated CGMS on the current status of the Communication, Ocean and Meteorological Satellite (COMS), the first Korean geostationary meteorological satellite which was launched in June 2010 and declared operational since 1 April 2011. Its longitude is 128.2°E. The COMS meteorological mission is performed by the MI (Meteorological Imager) with one visible channel and four infrared channels. The Korea Meteorological Administration (KMA) has the competence for MI operation and data distribution. This paper also presented the current status and future plans of the COMS MI operation and data service.

KMA-WP-03 presented the status of the Geostationary Ocean Colour Imager (GOCI), a payload of COMS and developed by KARI (Korea Aerospace Research Institute) and EADS Astrium, according to user requirements assigned by KORDI (Korea Ocean Research & Development Institute). GOCI has a unique capability of observing the ocean and coastal waters with high spatial resolution (500m), and with a very high temporal resolution (re-acquisition rate: 1 hour), thanks to a state-of-the-art optical design and satellite location in geostationary orbit. The Korea Ocean Satellite Center (KOSC) has the competence for GOCI operation and data distribution. GOCI data can be accessed via a website and the data policy declares the data free of charge for public/research purposes.

GOCI calibration and validation activities are conducting radiometric calibration and geometric correction, vicarious calibrations comparing satellite products with field measurements and improving the data processing algorithm. In order to coordinate the Cal/Val activities, the KOSC is organising the GOCI Cal/Val Advisory Group, comprised of both domestic and international experts. Application research of high quality GOCI data is being conducted in a diverse range of areas.

The paper also presented the status of GOCI and the data distribution service. GOCI Cal/Val activities and data applications were also described.

WMO congratulated KMA on its progress in product generation efforts since the last meeting of CGMS. This was echoed by all CGMS Members.

NOAA-WP-02/04 gave a report on the constellation of the four geostationary, as well as eleven polar orbiting meteorological spacecraft, including six military satellites, from the Satellite Operations Control Center (SOCC) in Suitland, Maryland. These satellites provide continuous observations of weather conditions and environmental features of the western hemisphere, monitor global climate change, verify ozone depletion and land surface change, monitor the critical space environmental parameters, and support search and rescue efforts across the globe. This document briefly addressed the status of the geosynchronous and low-earth-orbiting spacecraft constellations as of 31 August 2011.

The current Geostationary Operational Environmental Satellites (GOES) are three axis stabilised spacecraft in geosynchronous orbits. The current primary satellites, GOES-13 and GOES-11, are stationed over the east and west coasts of the United States. These satellites are used to provide simultaneous images and soundings of the Western Hemisphere. GOES-15 is located at 89.5 deg W supporting NWS Space Weather Prediction Center with the XRS and SXI instruments. GOES-12 was re-located at 60 deg W to support coverage of South America in May 2010. GOES-14 is in storage mode at 105 deg W. GOES-3 and GOES-7, spin-stabilized satellites from the previous GOES series, continue a track record of more than 55 years of combined service via continued support of non-NOAA users in a data relay mode (non-imaging).

GOES-P was launched on 4 March 2010 and reached geostationary orbit and was renamed GOES-15. The first visible image from GOES-15 arrived on 6 April 2010 and the first Infrared arrived on 26 April 2010. GOES-15 completed Post Launch Testing (PLT) and is in on-orbit storage mode at 89.5o W as a standby spacecraft for the operational GOES satellites.

ROSC-ROSH-WP-03 reported on the new geostationary meteorological satellite “Electro-L1 that was successfully launched on 20 January 2011. The satellite is about to finish its commissioning phase. The working paper contained the satellite payload description and status.

WMO welcomed this new programme and congratulated ROSC/ROSH on a successful launch. WMO expressed the hope that this programme would soon be integrated into the global space-based inter-calibration system (GSICS).

TABLE 2: CURRENT GEOSTATIONARY SATELLITES COORDINATED WITHIN CGMS

(Updated on 12 October 2011)

Sector	Satellites	Operator	Location	Launch date	Environmental payload and status
East Pacific (180°W-108°W)	GOES-11 (Op)	USA/NOAA	135°W	03/05/2000	5-channel imager, 19-channel sounder, DCIS, SEM Operational at GOES-West position X-Ray positioner failed in Oct 2008 Planned to be replaced by GOES-15 and decommissioned in December 2011

(P) = pre-operational
(Op) = Operational
(B) = Back-up, secondary
(L) = Limited availability

Sector	Satellites	Operator	Location	Launch date	Environmental payload and status
West Atlantic (108°W-36°W)	GOES-14 (B)	USA/NOAA	104.86°W	28/06/2009	5-channel imager, 19-channel sounder, DCIS, SEM, SXI In storage. Available for back-up.
	GOES-15 (P)	USA/NOAA	89.27°W	04/03/2010	In standby mode, Primary SXI and XRS for SWPC.Planned to become GOES-West at 135°W in December 2011
	GOES-13 (Op)	USA/NOAA	75 °W	24/05/2006	5-channel imager, 19-channel sounder, DCIS, SEM, SXI Operational at GOES-East position XRS/EUV instrument had a capacitor failure rendering unit inoperable.
	GOES-12 (B)	USA/NOAA	60°W	23/07/2001	5-channel imager, 19-channel sounder, DCIS, SEM Supports South America. SXI failed 4/12/2007, X-Ray Positioner failed 4/12/2007. No fuel remaining for inclination control.
East Atlantic (36°W-36°E)	Meteosat-9 (Op)	EUMETSAT	0°	21/12/2005	12-channel SEVIRI imager, GERB, DCS Data disseminated via EUMETCAST and LRIT
	Meteosat-8 (Op)	EUMETSAT	9.5°E	28/08/2002	Rapid Scanning Service and back-up of Meteosat-9. No Direct broadcast. Dissemination by EUMETCast.
Indian Ocean (36°E-108°E)	Meteosat-7 (Op)	EUMETSAT	57.5°E	02/09/1997	3-channel imager Dissemination via EUMETCast Indian Ocean Data Coverage (IODC), currently approved until end of 2013
	Kalpana-1 (Op) (previously METSAT)	INDIA	74°E	12/09/2002	3-channel VHRR imager, DCS
	Electro-L N1 (P)	Russian Federation / Roshydromet-Roscosmos	76°E	20/01/2011	In commissioning MSU-GS, HMS, DCS, GeoSAR. Direct broadcast HRIT, LRIT
	FY-2D (Op)	CHINA/CMA	86.5°E	08/12/2006	5-channel improved S-VISSR, SEM, DCS Complements FY-2 at 105°E
	INSAT-3A (Op)	INDIA	93.5°E	10/04/2003	Operational since 24/04/03. 3-channel VHRR imager, DCS and CCD camera
	FY-2E (Op)	China/CMA	105°E	23/12/2008	5-channel improved VISSR, SEM, DCS. Direct broadcast via LRIT
West Pacific (108°E-180°E)	FY-2C (B)	CHINA/CMA	123.5°E	19/10/2004	5-channel improved S-VISSR, SEM, DCS. Maintained as a back-up since 23 November 09.
	COMS-1(Op)	Korea/KMA, KORDI	128.2°E	26/06/2010	5-channel VIS/IR Meteorological Imager (MI), Geost. Ocean Colour Imager (GOCI) Direct Broadcast via HRIT/LRIT
	Himawari-6 (B) (MTSAT-1R)	JAPAN/JMA	140°E	26/02/2005	5-channel VIS/IR imager, DCS. Supports MTSAT-2 for direct broadcast from 140°E
	Himawari-7 (Op) (MTSAT-2)	JAPAN/JMA	145°E	18/02/2006	5-channel VIS/IR imager, DCS. Operational since July 2010, with data transmitted by MTSAT-1R

(P) = pre-operational
(Op) = Operational
(B) = Back-up, secondary
(L) = Limited availability

B.3 Research and Development Satellite Systems

CNSA-WP-01 informed CGMS about the status of the current China National Space Administration Earth Observation missions. Currently, the system is comprised of the FY series satellites, the HY-1B satellite, the HJ-1A&B satellites and the HY-2 satellite. This paper introduced the status of satellites of CNSA in orbit

HY-1 includes HY-1A and HY-1B satellites. The HY-1A satellite, which was launched on 15 May 2002, was designed to monitor ocean colour, sea surface temperature, and sea ice/coastal zone and to detect red tide and pollution events. HY-1A satellite stopped working on 30 March 2004.

The HY-1B satellite, equipped with two payloads: ocean colour and temperature scanner and 4- band CCD imager, was launched on 11 April 2007 for observing ocean colour and sea surface temperature. It can provide daily products for users in different application fields.

The Ocean Dynamics environmental satellite program (HY-2) has been developed since 2007. It has four payloads: Microwave Radar Altimeter, Microwave scatterometer and two Microwave Radiometers. The major target of the HY-2 mission is to monitor and detect marine dynamics status, including ocean surface wind, ocean surface height, the effective wave height, ocean gravity field, ocean circulation, sea surface temperature, and other important parameters for oceanic scientific researches. Furthermore, the HY-2 mission also provides satellite remote sensing information for marine environmental forecasting and global climate change research. HY-2 was launched on 16 September 2011 from Taiyuan Satellite Launching Center. After the launch, the satellite is experiencing a series of in-orbit tests and will be used for major operational applications from the beginning of 2012.

In **ESA-WP-01** CGMS was informed about the status of the current European Space Agency Earth Observation missions. Two of them, MSG and Metop are being carried out in co-operation with EUMETSAT.

The success of the Envisat mission, launched in 2002, is well-established, with a constant increase in user demand for data and services. Today the Envisat mission has exceeded the original foreseen 5 years lifetime and a 3 years extension from 2011 to 2013 has been approved. ERS-2, the second ESA EO mission, launched in 1995, has remained operational for 16 years before being de-orbited in the summer of 2011. Overall the ERS-1 and ERS-2 missions have delivered 20 years of valuable data. PROBA, an experimental ESA satellite, has provided remarkable hyperspectral data since 2001. The archive contains more than 15,000 products. The Gravity field and steady-state Ocean Circulation Explorer, GOCE, was launched on 17 March 2009. The nominal mission, consisting of 6 uninterrupted global measurement cycles, has been completed. GOCE data are of excellent quality. A new geoid, based on 3 cycles (6 months of data) has been released. The solution based on the full nominal mission data will be available in the fall of 2011. The Soil Moisture and Ocean Salinity mission SMOS was launched on 2 November 2009 and was commissioned in May 2010. SMOS Level 2 data products were released at the end of October 2010. Reprocessed data are available from the cal/val portal since mid-February 2011.

The Cryosat-2 satellite was successfully launched on 8 April 2010 and since then, commissioning and validation activities have taken place. Data was first released to the cal/val teams just after three months. Commissioning activities were completed on 25 October 2010. The release of systematic Cryosat products (Level 1b and 2) to the scientific community is ongoing. Greenland ice sheet and sea ice cover profiles reveal striking features of the Arctic behaviour, which is evolving further. The total volume of ESA EO mission data exceeds 100 Terabytes per year. Finally, problems relating to RFI (radio-frequency interference) have significantly improved over the last year or so.

JAXA-WP-01 reported on the current status of JAXA's Advanced Land Observing Satellite (ALOS) – "Daichi" and Greenhouse gases Observing SATellite (GOSAT) – "Ibuki". Daichi operations were stopped because of a power generation anomaly in April 2011; however, Sentinel Asia operation is successfully continued by the other Asian dedicated satellites.

Ibuki (GOSAT) operation is going on well. The data delivery is continued by JAXA (level 1) and NIES (level 2 and higher).

JAXA informed CGMS that AMSR-E operations on the NASA Aqua satellite were stopped in early October 2011. JAXA will report on the status of this instrument at the next CGMS.

EUMETSAT thanked JAXA for the successful data availability of GOSAT, which are highly useful for CO2 monitoring.

NASA-WP-01 summarised the current missions of NASA which currently operates 15 Earth Science missions. All missions are producing data, but several also show signs of aging. Except for SAC-D/Aquarius, recently launched in June 2011, all missions have passed their nominal design life, and are currently in extended operations.

Signs of battery aging have been observed in GRACE, CloudSat, and SORCE, all of which require intensive battery management and duty-cycling of instruments, which can reduce both quality and spatial/temporal coverage of the datasets. Aging mechanisms on the Aura TES instrument have restricted spatial coverage. Instruments with reduced capability are the Landsat-7 ETM+ (failed Scan Line Corrector), QuikSCAT's SeaWinds (antenna no longer rotates so that the data are used primarily to cross-calibrate with other on-orbit scatterometers), Terra's ASTER (SWIR module is no longer functional), and Aqua AMSU (Channel 4 has failed). Instruments that no longer provide data are TRMM's CERES, Jason's TRSR, Aqua's HSB, and Aura's HIRDLS. All other sensors are fully functional and are producing standard products that meet or exceed specifications.

The paper also presented a summary table for Frequency of Earth Science Missions Debris Avoidance Manoeuvres, a table on the Current NASA Missions and a table on the NASA-developed Instruments on non-NASA Missions. The Frequency of Earth Science Missions Debris Avoidance Manoeuvres has increased significantly between 2004 and 2010.

NASA provided positive news on the status of AQUARIUS. NASA and ESA have a joint Cal/Val Working Group, which is looking at joint activities using SMOS data.

WMO extended its appreciation to the R & D Agencies for their contributions to WMO programmes and underlined the importance of real time data access to R & D missions for operational meteorological applications.

TABLE 3: CURRENT R & D SATELLITES DISCUSSED WITHIN CGMS

Sorted by launch date.

Satellites	Space Agency	Equator Crossing Time + Altitude	Launch date	Instruments	Status, applications and other information
Orbview-2 (former SeaStar)	Geoeye (partnership with NASA)	12:00 (D) 780 km	01/08/1997	- SeaWiFs (Sea-Viewing Wide Field-of-view Sensor)	8-channel imager for ocean colour, vegetation and aerosols. Operated by GeoEye company under data-buy contract with US agencies.
TRMM	NASA/ JAXA	non-sun-synchronous (35° incl) 402 km	28/11/1997	- PR (Precipitation Radar) - TMI (TRMM MW Imager) - CERES - VIRS - LIS (Lightning Imaging Sensor)	Measures tropical rainfall/precipitation and radiation energy Precipitation Radar (PR) provided by JAXA Satellite bus and other instruments provided by NASA CERES no longer functional
Landsat-7	NASA	10:05 (D) 705 km	15/04/1999	- ETM+ (Enhanced Thematic Mapper Plus)	Well-calibrated, multispectral, moderate resolution, substantially cloud-free, sunlit digital images of the Earth's continental and coastal areas and selected coral reefs
Terra	NASA	10:30 (D) 705 km	18/12/1999	- CERES - MISR - MODIS - MOPITT - ASTER	Measurement of Earth' climate system, atmosphere, land, oceans and interactions with solar radiation
ACRIMSAT	NASA	10:50 (D) 720 km	20/12/1999	- ACRIM 3	(Active Cavity Radiometer Irradiance Monitor Satellite) Measures total solar irradiance
NMP EO-1	NASA	10:01 (D) 705 km	21/11/2000	- Advanced Land Imager - Hyperion - LAC (atmospheric corrector)	(New Millennium Program Earth Observing-1) Demonstrates and validates advanced technology instruments (multi and hyperspectral), spacecraft systems, and mission concepts in flight
PROBA	ESA	10:30 (D) 615 km	22/10/2001	- CHRIS	Drifting orbit. Technology experiment. AO Science mission since 2001.

Satellites	Space Agency	Equator Crossing Time + Altitude	Launch date	Instruments	Status, applications and other information
Jason-1	NASA/ CNES	non-sun-synchronous (66° incl) 1336 km	07/12/2001	- LRA (Laser retroreflector array) - Poseidon2 (solid state radar altimeter) - DORIS receiver - Jason Microwave Radiometer - BlackJack GPS Receiver	Ocean surface topography follow-on mission to TOPEX/Poseidon. Monitors global ocean circulation for global climate prediction
ENVISAT	ESA	10:00 (D) 800 km	01/03/2002	- ASAR, RA-2 - AATSR - MERIS - GOMOS - MIPAS - MWR - SCHIAMACHY	MIPAS is operated at 80% of its duty cycle. GOMOS performs regularly with reduced azimuth range since 29 august 2005. RA-2: loss of secondary frequency (in S-band) in Jan 2008, compensated with on-ground ionospheric corrections. ENVISAT orbit modified in Oct. 2010 (new altitude, new repeat cycle) to allow the operations to be extended to 2013. All scientific and operational applications have been maintained after the orbital change, with the exception of SAR Interferometry.
GRACE	NASA/ DLR	non-sun-synchronous (89°incl) 485 km	17/03/2002	- Star Camera Assembly - BlackJack GPS Receiver - Instruments Processing Unit - Laser Retro-Reflector Assembly - K-Band Ranging Instruments - SuperSTAR Accelerometers	(Gravity Recovery and Climate Experiment) Accurate global and high-resolution determination of static and time-variable components of Earth's gravity field. Measurement of: - Gravitational field - GPS atmospheric and ionospheric limb sounding
Aqua	NASA	13:30 (A) 705 km	04/05/2002	- AMSR-E - AIRS - HSB - AMSU-A - CERES - MODIS	Collects data on Earth's water cycle, precise atmospheric, land and oceanic measurements, and interaction with solar radiation. AMSR-E provided by JAXA. Stopped operations in October 2011 HSB provided by INPE (no longer functional)
SORCE	NASA	non-sun-synchronous (40° incl) 640 km	25/01/2003	- XPS (Extreme Ultraviolet (XUV) Photometer System) - TIM (Total Irradiance Monitor) - SIM (Spectral Irradiance Monitor A&B)	(Solar Radiation and Climate Experiment) Provides total solar irradiance measurements and full solar spectral irradiance measurements. Continuation of ACRIMSAT total solar irradiance measurements. - SOLSTICE (Solar Stellar Irradiance Comparison Experiment A&B)
Resourcesat-1	ISRO	10:30 (D) 817 km	Oct-03	- AWIFS	Land monitoring 4-channel camera
Aura	NASA	13:45 (A) 705 km	15/07/2004	- HIRDLS, - MLS (Microwave Limb Sounder) - OMI (Ozone Monitoring Instrument) - TES	Comprehensive measurements of atmospheric chemistry and trace gasses: HIRDLS = High Resolution Dynamic Limb Sounder (IR) TES = Tropospheric Emission Spectrometer
PARASOL	CNES	13:32 (A) 705 km	18/12/2004	- POLDER	Characterisation of clouds and aerosols microphysical and radiative properties. Data can be accessed for level 1 from CNES and for level 2 and more from Icare

Satellites	Space Agency	Equator Crossing Time + Altitude	Launch date	Instruments	Status, applications and other information
Cartosat-1	ISRO	10:30 (D) 618 km	May-05	- Carto-dem	High resolution stereo imagery 2 Panchromatic cameras
CALIPSO	NASA/ CNES	13:30 (A) 705 km	28/04/2006	- CALIOP - WFC - IIR	(Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observations for climate predictions)
CloudSat	NASA/ CSA	13:30 (A) 705 km	28/04/2006	- CPR (Cloud Profiling Radar)	Global cloud properties (applications: air quality, aviation safety, disaster management, energy and water management)
Resurs-DK	Roscosmos	360-690 km (70.4°incl)	15/06/2006		Land Observing satellite
HY-1B	CNSA	10:30 (D) 798 km	Apr-07	- 4-band CCD Camera - Ocean Colour and Temperature Scanner (OCTS)	Ocean monitoring
HJ-1A	CNSA	10:30 (D) 650 km	06/09/2008	CCD camera, Hyperspectral camera	Land, resource and environment monitoring
HJ-1B	CNSA	10:30 (D) 650 km	06/09/2008	CCD camera, IR camera	Land resource and environment monitoring
GOSAT (IBUKI)	JAXA & Japan's Ministry of Environment	13:00 (D) 666km	23/01/2009	TANSO/FTS, TANSO/ CAI	Greenhouse Gases Observing Satellite monitoring the distribution of the density of carbon dioxide
GOCE	ESA	06:00 (A) 260 km	17/03/2009	Electrostatic Gravity Gradiometer Satellite-to-Satellite Tracking Instrument	(Gravity field and Ocean steady-state Circulation Explorer)
Oceansat-2	ISRO	12:00am (D) 720 km	23/09/2009	OCM, ROSA , Scatterometer	ocean colour, Radio-occultation, ocean surface wind
SMOS	ESA	06:00 (A) 755 km	02/11/2009	MIRAS (Microwave Imaging Radiometer using Aperture Synthesis)	L-band radiometer for Salinity & Soil Moisture observation
CRYOSAT-2	ESA	717 km (92° incl)	08/04/2010	SIRAL (SAR Interferometric Radar Altimeter) + DORIS	Polar ice monitoring
Resourcesat-2	ISRO	10:30 (D) 817 km	20/04/2011	AWIFS	Land monitoring 4-channel camera
SAC-D Aquarius	CONAE / NASA	18:00 (A) 657 km	10/06/2011	L-band Radiometer and Scatterometer, HSC, MWR, NIRST, ROSA, Carmen-I, SODAD	Sea surface salinity Soil temperature, atmospheric sounding, space environment
HY-2A	CNSA, NSOAS	06:00 (D) 964 km	16/08/2011	Altimeter, MW radiometer, Scatterometer	Ocean monitoring
Megha-Tropiques	ISRO + CNES	Non sun-synchronous	12/10/2011	MADRAS (microwave imager), SAPHIR (183 GHz humidity microwave sounder), SCARAB (outgoing radiative flux at TOA), ROSA (Radio Occultation Sounder of the Atmosphere)	Monitoring convective systems, water cycle and energy budget in tropical atmosphere

B.4 Other LEO Satellites

NOAA-WP-03 informed CGMS on how the NOAA manages a constellation of four geostationary and eleven polar orbiting meteorological spacecraft, including six military satellites, from the Satellite Operations Control Centre (SOCC) in Suitland, Maryland.

The collection of precise measurements of sea surface height is essential for ocean climatology and ocean weather applications. Ocean climatology includes global sea-level rise, a key indicator of climate change, decadal variability in the ocean, seasonal/ inter-annual variability, and coastal variability and its impact on ecosystems. Ocean weather involves operational oceanography, surface wave forecasting and evaluation, and hurricane intensity forecasting.

Research satellites, TOPEX/Poseidon and Jason-1, have been instrumental in providing sea surface height measurements necessary for ocean modelling, forecasting El Niño/La Niña events, and hurricane intensity prediction. The currently operational satellite OSTM/Jason-2 launched in June 2008 maintains data measurements continuity.

The Jason-3 mission will ensure the continuity of the 20 plus year data record. Jason-3 is a joint U.S. and European mission. The current launch readiness date of Jason-3 is 2014.

This paper also presented the operational Jason-2 mission status and an overview of NOAA activities performed to support the Jason-2 mission and plans for the Jason-3 mission.

B.5 Spacecraft Anomalies from Solar and other Events

EUM-WP-05 provided an updated report on all anomalies attributed to solar events that had been detected on EUMETSAT in-orbit satellites (i.e. Metosat-6, -7, -8 and -9 and Metop-A) from 1 July 10 until 30 June 11.

NOAA-WP-05 provided an example of a new space weather product under development, the progression and prediction of the solar cycle, a summary of recent significant space weather events, including energetic electron activity, and a description of how NOAA GOES data are used for satellite anomaly assessment. The new product is one that will serve customers, such as the satellite industry and those who depend on conditions in the space environment that affect satellites used for communication, navigation, and other daily activities. Predictions are given for the year and magnitude of Solar Cycle 24 maximum. The consensus prediction is that the new cycle will be smaller than recent cycles and reach maximum in May 2013. This prediction, of great importance for planning activities affected by solar activity, will be updated as needed. Information was provided that shows space weather activity increasing during August 2009 through July 2010 emerging from the recent solar minimum. While it is typical for energetic electron fluxes to increase during the declining phase of the solar cycle as recurrent coronal holes produce regular intervals of high-speed solar wind that interacts with the geomagnetic field, we are still observing intervals of high electron fluxes. Electron fluxes reached high levels on 46% of days during the last five months of the period. Finally, NOAA described how the GOES data were used to characterise the space weather environment during the Galaxy 15 anomaly.

WMO-WP-01 provided a report from the Inter-Programme Coordination Team on Space Weather (ICTSW). WMO reported that the sixteenth World Meteorological Congress (Cg-XVI) had noted that a coordinated effort by WMO Members was needed to address the observing and service requirements to protect against the global hazards of Space Weather. It had invited the WMO Space Programme, in coordination with the ICTSW and with the relevant technical commissions (CBS and CAeM), to develop near-term and far-term action plans, including education and training, and to work with the WMO Regional Associations to implement a coordinated strategy for Space Weather. The ICTSW is now an active team within WMO with the goal of facilitating international coordination of space weather observations, products, and services. This goal is achieved by increasing global awareness of space weather impacts, advocating for improved observations, coordinating data and services, creating partnerships to share responsibilities, and encouraging research.

Current ICTSW activities include documenting space weather observing requirements, identifying high-priority gaps, and delivering coordinated information on products and services delivered by space weather centres around the globe on a WMO-sponsored web portal. Long-term goals include encouraging the high-level coordination of satellite-based assets for space weather to ensure that high-priority gaps are addressed in a cost-effective manner through shared capabilities, and supporting data exchange and dissemination through the WMO Information System. CGMS satellite operators are encouraged to work with the ICTSW to coordinate the planning and utilization of space weather observations.

CGMS acknowledged the relevance of Space Weather activities for its Members not only because CGMS members' satellites are affected by space weather events, but also because of the contribution of CGMS

members to space weather observations and warning services. It was agreed to replace Permanent Action 02 (CGMS Members to report on spacecraft anomalies from solar events at CGMS meetings) by a broader action encompassing the impact of space weather events on spacecraft as well as space weather observations and warning services. Furthermore, CGMS gave an action to WMO, through the ICTSW, to develop a template in order to facilitate harmonised reporting on spacecraft anomalies due to space weather.

The Chairman indicated that there were two aspects in this discussion:

- The impact of space weather;
- Space weather services and related observation requirements.

WMO agreed to investigate how the existing ISES products could be documented and how ISES centres might be recognised as data centres within the WIS.

The Chairman invited other agencies to report on space weather activities in future meetings of CGMS. Experience from CGMS members should be shared and these contributions should be considered by WMO for integration as part of operational services, included in the WIS.

CGMS agreed that for future meetings, Agenda item B.5 would be split into a) Space Weather, and b) space debris.

Permanent Action 02: CGMS Members to report to CGMS plenary on their activities and plans related to space weather including: (i) impact of solar events and space radiation on satellites, protective measures, (ii) space weather observations, and (iii) space weather warning services.

Action 39.01: Interested CGMS members to contact NOAA for assistance in obtaining conjunction warning support from the U.S. Joint Space Operations Center (JSpOC). Deadline: CGMS-40

Action 39.02: WMO, through ICTSW, to propose a template in advance of CGMS-40 in order to facilitate harmonised reporting on spacecraft anomalies related to space weather. Deadline: 1 May 2012

EUM-WP-12 reported on EUMETSAT activities on Space Debris mitigation and Collision Avoidance measures.

The paper, after giving some information about the EUMETSAT general activities on Space Debris mitigation, also provided a more detailed report on the Meteosat-6 re-orbiting and on the 1st Collision Avoidance manoeuvre executed with Metop-A on 1 May 2011.

NOAA-WP-06 informed CGMS that NOAA actively engages in space debris and collision avoidance mitigation activities from early design and acquisition through to operations and end-of-mission disposal operations. NOAA implements international outer space treaties and related U.S. best practices for all design and on-orbit flight safety activities. NOAA subject matter experts participated as working group members for a U.S. Government-wide task to implement the August 2010 National Space Policy. As necessary, NOAA continues to assist EUMETSAT's operational interface with the U.S. Strategic Command's Joint Space Operations Center (JSpOC) for real-time exchange of collision avoidance information. NOAA offers similar assistance to other CGMS members if desired.

The Chairman reported that ESA has conducted an activity on space situational awareness since its Ministerial Council of 2008. In future there would be a coordinated European contribution in this area.

EUM-WP-24 described tools to monitor EUMETSAT's operational instruments for both the geostationary Meteosat and polar-orbiting Metop satellites. These include various instrument monitoring systems which allow operators to check their housekeeping and calibration parameters. These are complemented by the Global Space-based Inter-Calibration System (GSICS) bias monitoring, which is currently being developed to allow operators and users to examine the results of comparisons with reference instruments in order to assess and correct the instruments' calibration.

EUMETSAT's operational instruments performed well during the period 2010-2011, with only minor anomalies, which are reported. In addition to the degradation of the IR13.4 channel of Meteosat-9/SEVIRI, due to a build-up of ice contamination, its IR3.9 channel is developing a small bias, the cause of which is unknown. Also, a correction has been developed for the small inter-pixel calibration bias in Metop-A/IASI.

Plans for monitoring instruments on future EUMETSAT mission were also outlined in the working paper.

C. REPORT ON FUTURE SATELLITE SYSTEMS

C.1 Future Polar-Orbiting Meteorological Satellite Systems

CMA-WP-05 informed CGMS that the follow-on FY-3 series of satellites contains at least four spacecraft models: FY-3C/D/E/F. The instrument payloads will be modified, either to replace the old instrument models with more advanced ones, or for additional measurements that require new instruments to be put on board. New instruments include the HIRAS that replaces IRAS for vertical air sounding, the WindRAD for sea winds, and the GAS for greenhouse gases absorption measurement. CMA plans to maintain two FY-3 spacecraft operational in orbit (morning and afternoon orbits). The planned schedule for flying the instruments on future spacecraft guarantees the measurement of each instrument to be taken on a daily basis.

CGMS welcomed the development and implementation of the high Resolution IR Sounder on board future CMA polar-orbiting satellites.

EUM-WP-06 described the status of preparations for the launch of the EPS Metop-B satellite, foreseen for May-June 2012. Preparation activities include the satellite assembly integration and test (AIT), launch and early operations phase (LEOP) and launcher procurement, ground segment upgrades, system integration and verification and validation (V&V) and operational preparations.

Metop-A and B will be operated in parallel and new products will be made available in due course.

EUM-WP-07 presented the status of the Preparatory Programme for the EPS Second Generation (EPS-SG), currently in Phase A development.

The roadmap for approval of the Programme at EUMETSAT and ESA has been consolidated, and interactions with the International and European National Partners has intensified in order to negotiate the necessary draft cooperation agreements.

ESA industrial competitive studies, started in January 2011 and addressing Phase A and Phase B1, are running for completion in late 2012. The ESA Phase A Preliminary Concept Reviews (PCR) were held in July 2011, consolidating the main trade-offs and thus focusing the work in the remaining part of the Phase A, which will be closed by the Space Segment Preliminary Requirements Reviews (PRR) in spring 2012, after the EPS System level Preliminary Requirements Review planned to be held in January-February 2012.

The 3rd Post-EPS User Consultation Workshop was held in Darmstadt on 29-30 September 2011. The presentations of the workshop are now accessible via the EUMETSAT web page using the link below:

http://www.eumetsat.int/Home/Main/Satellites/EPS-SG/Resources/index.htm?l=en

The major decision expected at EUMETSAT level is the approval of the EPS-SG Space Segment scope and Payload Complement in early 2012, to be used as a baseline for the ESA Metop-SG Development Programme to be approved at the ESA Ministerial Council at the end of 2012 (ESA C-MIN-12). This roadmap was approved at a special EUMETSAT Council on 5 October 2011. The same Council also approved the opening of the EPS-SG Preparatory Programme (Phase-B).

NOAA-WP-07 discussed its future polar-orbiting environmental satellite system. NOAA addressed the current operational system. Information was provided on the international polar-orbiting satellite program coordination between EUMETSAT and NOAA. The goal of this cooperation is to provide continuity of measurements from polar orbits, cost sharing, and improved forecast and monitoring capabilities through the introduction of new technologies. An agreement is in place between NOAA and EUMETSAT on the Initial Joint Polar-orbiting Operational Satellite System (IJPS). This program will include two series of independent, but coordinated NOAA and EUMETSAT satellites, exchange of instruments and global data, cooperation in algorithm development, and plans for real-time direct broadcast. The document also discussed the development and implementation plans for JPSS. Spacecraft will be launched into an orbital plane to provide significantly improved operational capabilities and benefits to satisfy the critical civil and national security requirements for space-based, remotely sensed environmental data. The advanced technology visible, infrared, and microwave imagers and sounders that are being developed will deliver higher spatial and resolution atmospheric, oceanic, terrestrial, and solar-geophysical data enabling more accurate short-term weather forecasts and significantly improved long range numerical weather forecasts as well as serving the data continuity requirements for improved global climate change assessment and prediction. The program is on the path to creating a high performance, polar-orbiting satellite system that will be more responsive to user requirements and provide sustained, space-based measurements as a cornerstone of an Integrated Global Observing System. These activities represent a sound beginning for achieving the planned national and international operational satellite programs that will ensure continuous support to a variety of users. The NPP launch is planned on 27 October 2011. NPP is the first of a new generation of US polar-orbiting meteorological satellites, and the launch event will

provide an opportunity learn more about the NPP mission and its importance for NOAA and EUMETSAT users. There will also be a live transmission of the launch from Vandenberg Air Force Base, in California.

ROSC/ROSH-WP-04 gave information on the Russian polar-orbiting satellite system. It consists of three hydrometeorological and oceanographic satellites. The payload of the meteorological Meteor-M2 and oceanographical Meteor-M3 satellites were described in the document.

The Meteor-M2 is about to be launched in 2012. The oceanographical satellite Meteor-M3 is scheduled for 2015. The development of a New Generation Satellite Constellation Meteor-MP has been started in 2011. The Meteor-MP satellite constellation will comprise of 3 satellites: two meteorological and one oceanographical satellite. The Meteor-MP payload will be basically similar to that of Meteor-M, but with improved performance characteristics. The launch of the first Meteor-MP series satellite is scheduled for 2016.

WMO expressed its appreciation for these ambitious programmes and queried the Equator Crossing Time (ECT) of these satellites.

ROSHYDROMET responded that the Meteor-M2 ECT will be 09:30 and that of Meteor-M3 ECT will be 16:30.

IOC highlighted the importance of the scatterometer planned on Meteor-M3 and invited ROSC/ROSH to participate in JCOMM activities. This was welcomed by ROSC/ROSH.

TABLE 4: FUTURE POLAR-ORBITING SATELLITES COORDINATED WITHIN CGMS

Orbit type	Satellites	Operator	ECT Ascending Node	Mean Altitude	Launch date	Instrument payload and status
Sun-synchronous "Afternoon" orbit ECT between 12:00-17:00 and between 00:00-05:00	NPP (NPOESS Preparatory Project)	USA NOAA/NASA	13:30	833 km	27-Oct-11	VIIRS, CrIS, ATMS, OMPS, CERES
	JPSS-1	USA/NOAA	13:30	833 km	Nov-16	VIIRS, CrIS, ATMS, CERES, TSIS, OMPS/Nadir. Products: Products Payload and products still TBC
	JPSS-2	USA/NOAA	13:30	833 km	Nov-21	VIIRS, CrIS, ATMS, OMPS/Nadir Payload and products still TBC
	FY-3D	CHINA/CMA	14:00	836 km	2015	AHRPT/MPT transmission; MERSI-2, GAS, HIRAS, MWTS-2, MWHS-2, SES, GNOS
	FY-3F	CHINA/CMA	14:00	836 km	2019	AHRPT/MPT transmission; MERSI-2, GAS, HIRAS, MWTS-2, MWHS-2, SES, GNOS
	METEOR-M 2-2	Russian Federation / Roshydromet-Roscosmos	Afternoon (Time TBD)	820 km	2015	MSU-MR, MTVZA, , KMSS, Severjanin, GGAK-M,IRFS-2, DCS. Dissemination: HRPT, LRPT
Sun-synchronous "Early morning" orbit ECT between 17:00-19:00 and between 05:00-07:00	DMSP-F19	USA/NOAA-DOD	17:XX	848 km	End 2012	

ECT = Equator Crossing Time (for sun-synchronous orbits)

Orbit type	Satellites	Operator	ECT Ascending Node	Mean Altitude	Launch date	Instrument payload and status
Sun-synchronous "Morning" orbit ECT between 19:00-24:00 and between 07:00-12:00	DMSP-F20	USA/NOAA	19:XX	848 km	End 2014	
	Metop-B (Metop-1)	EUMETSAT	21:30	837 km	May-12	AVHRR, HIRS, MHS,AMSU-A, IASI, ASCAT,GRAS GOME.
	Metop-C (Metop-3)	EUMETSAT	21:30	837 km	End 2016	AVHRR, MHS,AMSU-A, IASI, ASCAT,GRAS GOME
	METEOR-M 2	Russian Federation / Roshydromet-Roscosmos	21:30	836 km	Sep-12	MSU-MR, MTVZA, IRFS-2, KMSS, Severjanin, GGAK-M, DCS. Dissemination: HRPT, LRPT
	M N2-1	Russian Federation / Roshydromet-Roscosmos	21:30	820 km	2014	MSU-MR, MTVZA, IRFS-2, KMSS, Severjanin, GGAK-M, DCS. Dissemination: HRPT, LRPT
	FY-3C	CHINA/CMA	22:00	836 km	2013	VIRR, MERSI-2, IRAS, MWTS-2, MWHS-2, TOUS/SBUS, MWIRI, ERM-1, SIM-2. AHRPT/MPT
	FY-3E	CHINA/CMA	22:00	836 km	2017	AHRPT/MPT transmission; MERSI-2, WindRD, HIRAS, MWTS-2, MWHS-2, WindRAD, OMS, SES , ERM-2, SIM-2, GNOS
	FY-3G	CHINA/CMA	22:00	836 km	2021	AHRPT/MPT transmission; MERSI-2, WindRD, HIRAS, MWTS-2, MWHS-2, WindRAD, OMS, SES , ERM-2, SIM-2, GNOS
	METEOR-M 3	Russian Federation / Roshydromet-Roscosmos	TBD	835 km	2015	MSS-BIO, SCAT, OCS, Radiomet, Severjanin-plus Dissemination: HRPT, LRPT
Non sun-synchronous	Jason-3 (Ocean Surface Topography Mission)	NASA/NOAA/ EUMETSAT/ CNES	(66° inclin.)	1336 km	2013	Follow-on of Jason-2 Sea surface topography measurement
	FY-3 RM 1	CHINA/CMA	inclin.TBD	TBD	2015	Ku/Ka Precipitation Radar, MWTS, MWHS, MWRI
	FY-3 RM 2	CHINA/CMA	inclin.TBD	TBD	2019	Ku/Ka Precipitation Radar, MWTS, MWHS, MWRI

ECT = Equator Crossing Time (for sun-synchronous orbits)

C.2 Future Geostationary Meteorological Satellite Systems

CMA-WP-06 reported that CMA has for some time embarked upon the preparation of Fengyun 4 (FY-4) - its next generation of geostationary meteorological satellites, a three-axis stabilized platform that will provide CMA with enhanced space-based observations in the future. Based on user requirements and technical feasibility, the missions of FY-4 include imagery, sounding, lightning mapping and space environment monitoring. HRIT, LRIT data transmission, and DCS are available for users. The paper also informed CGMS that the first flight model FY-4A has been approved, is being manufactured, and is scheduled for launch in 2015. It will serve as a test and demonstration of the system.

CGMS commented that it was very much looking forward to the advanced capabilities of FY-4 series of satellites.

EUM-WP-08 addressed the status of the remaining development work for the MSG Programme, namely the preparation of MSG-3 for launch and commissioning, and the progress on the MSG-4 readiness before storage or launch.

In particular, as concerns MSG-3, in the reporting period:

- Mid-June – mid-July 2012 has been agreed with Arianespace as launch slot for MSG-3 on an Ariane 5 ECA;
- The satellite destorage activities have been kicked-off and are on schedule;

- The LEOP service activities have been kicked-off and are on schedule;
- The Launch service Mission Analyses have been completed and all compatibility issues between MSG-3 satellite and the Ariane 5 launch vehicle have been clarified;
- The upgrade of the EUMETSAT Ground Segment to enable the commissioning of MSG-3 in parallel to the routine operations of Meteosat-8 (MSG-1) and Meteosat-9 (MSG-2) has been completed.

Concerning MSG-4, in the reporting period:

- A major anomaly was discovered during acceptance testing of the new SEVIRI Drive Unit, concluding that additional work is required to replace or refurbish one part inside the DU which is a long lead item;
- Consequently, the earliest readiness for launch of MSG-4 is now by end 2014/January 2015;
- EUMETSAT is currently planning the MSG-4 launch in January 2015, with an in orbit storage phase of the satellite after its commissioning, to maximise the duration of overall operations between MSG and MTG.

EUM-WP-09 presented the status of the activities for the Meteosat Third Generation (MTG) Programme. It addressed the progress achieved up to early September 2011, and the short term objectives upon which EUMETSAT is concentrating its efforts in the design and development of the system. The status of MTG activities at ESA was also addressed.

The entry into force of the Council Resolution implementing the MTG Programme at EUMETSAT in February 2011 has enabled the work to progress in Phase B in all programme segments and the Phase C/D to commence at System level. After the System Preliminary Design Review (System PDR) took place at EUMETSAT between May and June 2011, the work is addressing consolidation and update of requirements and plans at system level in line with the established actions at PDR. Extensive effort continues in the scientific activities targeting the definition of the future mission products, involving internal and external experts, National Meteorological Services, scientific institutions and the international cooperation. Finally, Ground Segment (GS) activities at EUMETSAT have focussed at the consolidation of GS system requirements as part of the System PDR, and then at the preparation of the GS PDR (spring 2012) and of the future ground segment procurements.

At Satellite level, as part of the ESA MTG programme, activities have addressed the consolidation of requirements and the design in line with the actions open from the Phase B2 Kick Off in November 2010 or specifically established at the satellite System Requirements Review (Satellite SRR) in spring 2011. Intensive work is also ongoing associated with the Procurements under Best Practices. A Satellite Baseline Definition Review (BDR) is planned in November 2011, before approaching the main elements (Instruments and Platform) PDRs and then the satellite PDR for both MTG-I and MTG-S, until late spring 2012.

JMA-WP-03 provided a report on JMA's plans for Himawari-8 and Himawari-9 – the follow-on satellites to MTSAT-2.

JMA plans to launch Himawari-8 in summer 2014 and commence its operation in 2015, when MTSAT-2 is scheduled to complete its period of operation. The Agency also plans to launch Himawari-9 in 2016.

In July 2009 JMA completed contract arrangements for the manufacture of Himawari-8 and 9, which have identical specifications. Currently, their production is in the design phase.

Himawari-8 and 9 carry Advanced Himawari Imager (AHI) units comparable to the Advanced Baseline Imager (ABI) on board GOES-R to enable enhanced Nowcasting, NWP and environment monitoring.

JMA plans to use two ground stations to establish site diversity in the interests of mitigating the rain attenuation effect on the Ka-band to be used for the imagery data downlink. Downlinked data will be delivered to the Meteorological Satellite Center, which generates satellite products and delivers them to users.

JMA-WP-07 informed CGMS that the AHI imagers on board Himawari-8/9 will have a higher level of observing capability than the MTSAT-2 imager. In association with this enhancement, JMA is improving its current satellite products (particularly those based on atmospheric motion vector data) as well as developing new products related to instability indices and volcanic ash.

To support these developments, Himawari-8/9 simulated images are generated in two ways – one involving the accumulation of high-spectral-channel observations from hyper sounders such as AIRS and IASI, and the other using radiative transfer computation based on the provisional response functions of Himawari-8/9.

KMA-WP-04 reported on tentative plans for follow-on satellites to COMS. Currently, KMA plans to launch a follow-on satellite in 2017 before COMS completes its operations. The satellite will embark a space weather payload.

IOC commented that it was very pleased with the Ocean Colour capabilities on board the COMS satellite. EUMETSAT, in the context of the WMO Virtual

Laboratory (VL), welcomed the early user engagement to prepare for the use of the GOES-R data and noted that this approach might apply to all CGMS Members when planning for their future programme.

KMA added that the follow-on satellite is tentatively planned to carry an imager comparable to the Advanced Baseline Imager (ABI) or the Flexible Combined Imager (FCI).

NOAA-WP-08 provided a status and an overview of the future GOES satellite system. Steady progress continued on the development of the GOES-R program throughout 2011. The spacecraft and ground segment are in their design phase and each of the instruments is in the first flight model fabrication phase. The new GOES-R instruments will advance operational environmental remote sensing technology by several decades. The technological advances will provide environmental information over a greater geographical location in less time, at higher resolutions, and with higher spectral content.

ROSH/ROSC-WP-05 provided information on the future Russian geostationary meteorological constellation which would consist of 3 Electro-L series satellites. These would be placed at 14,5°W, 76°E and 166°E. It was also planned to complement this constellation with two Electro-L – type satellites on high-elliptical orbits to cover the Arctic region (Arctica project).

EUMETSAT asked whether coordination was planned between Elektro-L Molnya and PCW of Canada.

ROSHYDROMET indicated that these missions will fly in a constellation. ROSHYDROMET also confirmed that it plans to locate a satellite at 14° W, over the Atlantic, in order to achieve a wide coverage requested by Russian national use.

TABLE 5: FUTURE POLAR-ORBITING SATELLITES COORDINATED WITHIN CGMS

Sector	Satellites	Operator	Location	Launch date	Environmental payload and status
East Pacific (180°W-108°W) and **West Atlantic** (108°W-36°W)	GOES-R	USA/NOAA	135°W or 75°W	Oct-15	ABI, GLM, SUV, EXIS, SEISS (Advanced Baseline Imager, Geostationary Lightning Mapper, Solar UV Imager, Extreme UV and X-ray Irradiance Sensors, Space Environment In-Situ Suite). Ready for launch in 2015 if needed.
	GOES-S	USA/NOAA	135°W or 75°W	Feb-17	ABI, GLM, SUV, EXIS, SEISS Ready for launch in 2016 if needed.
East Atlantic (36°W-36°E)	Electro-L N2	Russian Federation/ Roshydromet-Roscosmos	14.5°W	2013	MSU-GS, HMS, DCS, GeoSAR. Direct broadcast HRIT, LRIT
	Meteosat-10 (MSG-3)	EUMETSAT	0°	06/08/2012	12-channel SEVIRI imager, GERB, DCS Dissemination by LRIT and EUMETCast
	Meteosat-11 (MSG-4)	EUMETSAT	0°	Jan-15	12-channel SEVIRI imager, GERB, DCS
	MTG I1	EUMETSAT	0°	Dec-18	Meteosat Third Generation/ Imaging (FCI, LI)
	MTG S1	EUMETSAT	0°	2019	Meteosat Third Generation/ Sounding (IRS, UVN)
	MTG I2	EUMETSAT	0°	2022	Meteosat Third Generation/ Imaging (FCI, LI)
	MTG I3	EUMETSAT	0°	2026	Meteosat Third Generation/ Imaging (FCI, LI)
	MTG S2	EUMETSAT	0°	2027	Meteosat Third Generation/ Sounding (IRS, UVN)
	MTG I4	EUMETSAT	0°	2030	Meteosat Third Generation/ Imaging (FCI, LI)
Indian Ocean (36°E-108°E)	Electro-M N1	Russian Federation/ Roshydromet-Roscosmos	76°E	2018	
	INSAT-3D	India	82° E	2011	Improved 6-channel Imager and 19-channel sounder

Sector	Satellites	Operator	Location	Launch date	Environmental payload and status
Indian Ocean (36°E-108°E)	FY-2F	China/CMA	86.5°E	2012	5-channel improved VISSR, DCS, SEM. Direct broadcast via LRIT
	FY-4A	China/CMA	TBD	2015	multi-spectral imager, Atmospheric sounder, lightning mapper, SEM
	FY-2H	China/CMA	86.5°E	2016	5-channel improved VISSR, DCS, SEM. Direct broadcast via LRIT
	FY-4C	China/CMA	TBD	2019	multi-spectral imager, Atmospheric sounder, lightning mapper, SEM
	FY-4E	China/CMA	TBD	TBD	multi-spectral imager, Atmospheric sounder, lightning mapper, SEM
West Pacific (108°E-180°E)	FY-2G	China/CMA	123°E	2014	5-channel improved VISSR, DCS, SEM. Direct broadcast via LRIT
	FY-4B	China/CMA	TBD	2017	multi-spectral imager, Atmospheric sounder, lightning mapper, SEM
	FY-4D	China/CMA	TBD	TBD	multi-spectral imager, Atmospheric sounder, lightning mapper, SEM
	FY-4 F	China/CMA	TBD	TBD	multi-spectral imager, Atmospheric sounder, lightning mapper, SEM
	GEO-KOMPSAT-2A	Korea/KMA	116.2°E or 128.2°E	2017	Advanced Meteorological Imager, Space Environmental monitoring payload Direct Broadcast via HRIT/LRIT
	GEO-KOMPSAT-2B	Korea/MLTM (Ministry of Land, Transport and Maritime Affairs), ME (Ministry of Environment)	116.2°E or 128.2°E	2018	Advanced Geostationary Ocean Color Imager (GOCI), Geostationary Environmental Monitoring Spectrometer (GEMS)
	Himawari-8 (MTSAT follow-on)	JAPAN/JMA	140.7°E or 143.3°E	2014	-Advanced Himawari Imager (AHI), DCS, SEM
	Himawari-9	JAPAN/JMA	140.7°E or 143.3°E	2016	-Advanced Himawari Imager (AHI), DCS, SEM
	Electro-L N3	Russian Federation / Roshydromet-Roscosmos	165.8°E	2015	MSU-GS, HMS, DCS, GeoSAR. Direct broadcast HRIT, LRIT
Highly Elliptical Orbit (non-geo-stationary)	Arctica-M N1	Russian Federation / Roshydromet-Roscosmos"	Molnya Orbit	2015	MSU-GS, Space Weather Instruments, DCS
	Arctica-M N2	Russian Federation / Roshydromet-Roscosmos	Molnya Orbit	2016	MSU-GS, Space Weather Instruments, DCS

C.3 Future Research and Development Satellite Systems

CNSA-WP-02 informed CGMS about the status of the future China National Space Administration Earth Observation missions. It included FY-4, CBERS 03/04, HJ-1 C, and the ZY-3 satellites. FY-4 (described in C.2 above) is to be launched in 2015. ZY-3, HJ-1C and CBERS 03 will be launched in 2012, developed jointly by China and Brazil.

The objectives of CBERS 03/04 are the same as those of CBERS 01/02. CBERS 03 will be launched at the end of 2012; CBERS 04 will be launched in 2014, providing high resolution and multi-spectral data.

HJ-1C is the S-band SAR satellite which is being developed in phase C, It is part of an environment and disaster monitoring small satellite constellation, which will be launched in 2012.

ZY-3 is a high-resolution three-dimensional mapping satellite, which will be launched at the beginning of 2012.

In response to a query from WMO concerning the status of data access to HY-2A data, CNSA expressed the hope that data exchange would be implemented after commissioning.

IOC welcomed the new ocean observing satellites, adding that JCOMM was planning a major activity on winds. IOC would welcome CNSA participation in this activity.

CGMS expressed high interest in ocean observations from HY-2 and invited CNSA to keep CGMS members informed on possible access to data once HY-2 commissioning is completed.

ESA-WP-02 informed CGMS on the status of the future European Space Agency Earth Observation missions. Two of them, MTG and EPS SG are in co-operation with EUMETSAT. The Living Planet Program has three lines of implementation: Earth Explorer (EE) satellites, Earth Watch satellites plus services & applications demonstration.

A 7th Earth Explorer is under selection out of 3 pre-selected. Progress in the preparation of the forthcoming Explorer missions ADM-AEOLUS, Swarm and EarthCARE are described.

GMES represents the major new initiative of European efforts in Earth Observation. The start of the GMES pre-operational services took place in 2008, with the provision of the relevant data. The first GMES dedicated satellites (the “Sentinels”) will be launched in 2013. Related activities are under way at all stages within the Agency, the EC and EU Member States.

The Aeolus mission will provide data to address some of the key concerns of the World Climate Research Programme i.e. quantification of climate variability, validation and improvement of climate models and process studies relevant to climate change. The provision of global wind profiles in cloud-free air will help to accomplish several objectives of the Global Climate Observing System and improve our understanding of the Earth’s global energy budget. Aeolus will also provide profiles of backscatter and extinction coefficients (so-called spin-off products), which will allow the retrieval of cloud and aerosol information.

EUMETSAT asked about the plans for NRT AEOLUS and EarthCARE data access, emphasising the importance for CGMS Members. ESA commented that it plans to release data after validation by science teams.

WMO supported this move and encouraged ESA to work with NWP centres to validate the data.

JAXA-WP-02 provided the current status of JAXA’s GCOM-W1/C1, GPM/DPR, EarthCARE/CPR and ALOS-2.

GCOM-W1 will be launched on schedule, in the January or February 2012 timeframe. Its official launch date will be announced soon. The GCOM-C1 launch date might be delayed as it is still competing for funding. Current plans are still 2014.

The DPR Flight Model has been tested in the Tsukuba Space Center, Japan. The CEOS Precipitation Constellation International Workshop will be held in November 2011, in Denver, US. EarthCARE is a joint programme with ESA. EarthCARE data table has been updated.

JAXA and NASA announced a launch date of GPM-Core in February 2014.

KMA-WP-02 reported on the KOMPSAT-5 program as a part of CGMS-38-KMA-WP-12. The first occultation mission in the Korean space program, KOMPSAT-5, is scheduled for launch in 2011. KOMPSAT-5 will have a dual frequency GPS receiver to generate precision orbit determination data and occultation data. This document describes the KOMPSAT-5 and GPS Radio Occultation Mission Characteristics.

WMO encouraged CGMS Members to participate in the CEOS Preciptiation Constellation-International Workshop taking place on 10 November 2011.

NASA-WP-02 gave a brief description of future missions from NASA's Earth Science Division.

With the U.S. President's FY2012 budget request, NASA's Earth Science Program is implementing a balanced and robust plan to accomplish a broad set of critical Earth observation measurements from space. The program advances knowledge of the integrated Earth system, the global atmosphere, oceans (including sea ice), land surfaces, ecosystems, and interactions between all elements, including the impacts of humans. A balance of satellite measurements, science research, technology development and applications are needed to address a complex global Earth system. The GPM-Constellation mission was cancelled.

TABLE 6: FUTURE R & D SATELLITES WITHIN CGMS

Satellites	Space Agency	Equator Crossing Time + Altitude	Launch Date	Status, applications and other information
Kanopus-V N1	ROSCOSMOS	510-540 km	2011	Monitoring of natural and man-made extreme events
GCOM-W1	JAXA	13:30 (A) 700 km	Japan Fiscal Year 2011	Global water and energy circulation. Will join the A-train.
SWARM	ESA	300/530 km (3 spacecraft)	Jul-12	Geomagnetic field
HJ-1C	CNSA	06:00 (D) 500 km	2012	Land monitoring S-band SAR
Lomonosovs	ROSCOSMOS/ Moscow State University	510-540 km	2012	Monitoring of natural and man-made extreme events
SARAL-Altika	ISRO + CNES	06:00 800 km	2012	Altika altimeter Argos Data Collection System
CBERS-3	CNSA + AEB	10:30 (A) 778 km	End 2012	Land monitoring CCD camera, IRMSS, WFI
LDCM	NASA / US Geological Survey	828 km (at equator) sun-synchronous	Dec-12	(Landsat Data Continuity Mission) Extension of Landsat record of multispectral 30m resolution
OCO-2	NASA	13:25 (A) 705 km	Feb-13	Orbiting Carbon Observatory (Remanufacturing of OCO spacecraft lost at launch on 24Feb 2009)
Sentinel-3A	ESA / EUMETSAT	10:00 (D) 815 km	Oct-13	Ocean and global land monitoring Radar altimeter (SRAL) and MWR, OLCI, SLSTR
ADM-Aeolus	ESA	18:00 (A) 405 km	2013	Doppler Lidar (ALADIN) wind profile by aerosol, clouds and molecular backscatter
CBERS-4	CNSA + AEB	10:30 (A) 778 km	2014	Land monitoring CCD camera, IRMSS, WFI
GPM (Core Observatory)	NASA / JAXA	407 km Non sun-synchronous (65° incl)	Feb 2014	Global Precipitation Measurement core spacecraft, follow-on and improvement of TRMM Dual-frequency (Ka/Ku) Precipitation Radar (DPR), GPM Microwave Imager (GMI)
GCOM-C1	JAXA	10:30 (D) 798 km	Japan Fiscal Year 2014	Carbon cycle and radiation budget (Atmosphere, Ocean, Land and Cryosphere)
ALOS-2	JAXA	12:00 628km	Japan Fiscal Year 2014	PALSAR-2
SMAP	NASA	06:00 690 km	Nov-14	(Soil Moisture Active and Passive mission) L-band Synthetic Aperture Radar and L-band radiometer
Sentinel-3B	ESA / EUMETSAT	10:00 (D) 815 km	2015	Ocean and global land monitoring Radar altimeter (SRAL) and MWR, OLCI, SLSTR
ICESat-2	NASA	(94° incl) 600 km	Oct-15	Ice, Cloud and land Elevation Satellite (ICESat Follow-on) Payload: GLAS
EarthCARE	ESA-JAXA	10:30 (D) 450 km	Nov-15	ATLID, BBR, CPR, MSI, Cloud, radiation and aerosol interaction processes

Satellites	Space Agency	Equator Crossing Time + Altitude	Launch Date	Status, applications and other information
GRACE-FO	NASA, DLR	Non-sun-synchronous (89°incl) 485 km	2016	(Gravity Recovery and Climate Experiment Follow-On) Accurate global and high-resolution determination of static and time-variable components of Earth's gravity field for ocean currents, ocean mass, and ice sheets. GPS atmospheric and ionospheric limb sounding measurements for pressure, temperature and humidity.
SWOT	NASA, CNES, USGS	TBD	2019	(Surface Water Ocean Topography) KA-Band Radar Interferometer for lake levels, river discharge, and ocean surface topography.Carbon Monoxide sensor.
ASCENDS	NASA	TBD	2019	(Active Sensing of Carbon dioxide Emissions over Nights, Days and Seasons) Active laser measurements of Carbon Dioxide
PACE	NASA, CNES, ESA	TBD	2019	(Pre-Aerosols, Carbon and Ecosystems Mission) Spectrometer measurements of ocean colour, Polarimeter measurements of aerosols.

C.4 Future other LEO Satellites

EUM-WP-11 presented the status of GMES.

In its contribution as operator of the Sentinel-3 oceanography mission, EUMETSAT will:

- Generate and disseminate all Sentinel-3 products routinely required by the GMES Marine Core Service and its related downstream services;
- Serve the offline requests of the Operational Oceanography User Community for Sentinel-3 products (using a distributed network of centres of expertise);
- Monitor and control the spacecraft and flight operations segment;
- Acquire payload data, in a mode consistent with the GMES ground segment, the design of which is under ESA's responsibility.

To fulfil this operational role, EUMETSAT has undertaken, under a co-operation agreement with ESA, the development of a ground segment to serve the needs of the Sentinel-3 mission as well as for the routine operations to be engineered, validated and rehearsed by a dedicated operations team.

The development activities have progressed well. The detailed design of the Flight Operations Segment and of the Payload Data Ground Segment is in progress. EUMETSAT is currently deeply involved with the procurement and the development of the facilities and services constituting the Ground Segment and the engineering of the associated operations preparation.

This paper also presented the status of the Sentinel-3 development activities by EUMETSAT and complements ESA-WP-02.

EUM-WP-10 reported on the status of Jason-3 which is a joint effort among four organisations: NOAA, EUMETSAT, CNES and NASA, to measure sea surface height by using a radar altimeter mounted on a low-earth orbiting satellite. The collection of precise measurements of sea surface height is essential for ocean climatology and ocean weather applications. Ocean climatology includes global sea-level rise, a key indicator of climate change, decadal variability in the ocean, seasonal/inter-annual variability, and coastal variability and its impact on ecosystems. Ocean weather involves operational oceanography, surface wave forecasting and evaluation, and hurricane intensity forecasting.

The Jason-3 mission will ensure the continuity of the 20 plus year data record started with TOPEX/Poseidon in 1992 and continued with Jason-1 and 2. The launch of Jason-3 is planned in Q2 2014 with a 6-month overlap with Jason-2. The overlap period will be used to conduct initial cross-calibration and validation activities, complete on-orbit check-out operations, and maintain consistent observations of sea surface height between the successive altimeter missions.

In order to ensure continuity of these key measurements over the next 15 years, discussions have been initiated between potential Partners in Europe and in the US on a new programme named Jason CS (Continuity of Service). The satellite would be based on the Cryosat 2 bus, and an industrial Phase B1 has been kicked off in fall 2010 to analyse and assess the modifications from Cryosat 2 to Jason-CS. The programme will be based on at least two satellites, the first one being launched in 2017 covering the time span before a new technology can eventually become operational.

This paper complemented NOAA-WP-03 under this Agenda item.

C.5 Future HEO or Combinations of LEO and GEO Missions

The Canadian Space Agency (CSA) gave a presentation on the status of its future Polar Communication and Weather Programme (PCW), which was made available under **CSA-WP-01**.

WMO thanked CSA for its contribution to CGMS and for the joint workshop organised with ROSHYDROMET on Highly-Elliptical Orbit missions for high latitudes. While anticipated as a Private-Public Partnership (PPP), PCW will also rely on intensive international cooperation and discussions are ongoing with the U.S, Russia and Europe.

D. OPERATIONAL CONTINUITY AND RELIABILITY

D.1 Global Planning, Including Orbital Positions and Recon-figuration of the Space-based Component of the GOS

WMO-WP-02 reported on Revision of the CGMS baseline for contributing to the Global Observing System.

It had been agreed at CGMS-38 to proceed with an update of the CGMS baseline for GEO, LEO and HEO satellites within the space-based Global Observing System (GOS), as a proposed target-configuration for 2015, and Actions A38.39, A38.41, A38.42 and Recommendations R38.19, R38.20 had been agreed in this respect. In response to Action 38.39, the Expert Team on Satellite Systems (ET-SAT) reviewed the issue in detail and proposed an updated baseline, which had been further reviewed by the CGMS-39 Working Group on Contingency Planning (WGIII). The outcome of these reviews has led to the following clarifications:

- The baseline focuses on the missions that are decided and managed in an operational or sustained framework, with a perspective of long-term follow-on;
- Missions that contribute to the baseline can thus be from either operational or R&D agencies, or transition missions in partnership among such agencies, as long as they have a clear perspective of long-term follow-on;
- This does not preclude the importance of missions undertaken e.g. on a research or demonstration basis;
- The baseline describes the missions committed as a whole by CGMS members, without explicit mention of which member is taking responsibility for which mission(s);
- There must be however a mapping of the baseline with the plans of individual CGMS members as these plans are known to-day, in order to give confidence that the baseline can be implemented; such a mapping was drawn by ET-SAT and reviewed by WG-III, it is attached to the report of WGIII;
- The baseline lists the missions to be performed, categorised by orbit types (GEO, LEO sun-synchronous, other LEO, and potentially HEO), as well as cross-cutting considerations on data availability and dissemination, inter-calibration and contingency planning;
- Appropriate frequency bands should be preserved for Direct Broadcast and other dissemination means to secure all-weather data transmission, Direct Broadcast protocols should be harmonized in the core mission on sun-synchronous orbits, in order to enable users to receive the data from the three orbital planes with broadly similar receiving infrastructure;
- From a contingency planning viewpoint, in case of potential gaps in core sun-synchronous mission, absolute priority should be given to observation from mid-morning and early afternoon orbits, in order to maintain the continuity of these datasets;
- Finally, not every mission from CGMS Members would include all the capabilities required in the baseline but the different missions complement each other and, all together, are expected to meet the requirements.

WMO stressed that the proposed new CGMS baseline would be a major enhancement of the previous baseline, and represent significant progress towards the full implementation of the Vision of the GOS in 2025. It would reflect not only advances in technology to support meteorological missions but also the expanding scope of missions assumed by CGMS members in particular in support of climate and environmental monitoring.

NASA insisted on the need to precisely define ‘sustained/operational’ in the document to ensure that contributions of R & D agencies could be properly reflected, as they contributed to the baseline. The document highlighted the R & D missions with the prospect of continuity versus operational missions for which a long-term commitment is taken.

CGMS-39 noted that the visible, infrared and microwave imagery and the infrared and microwave sounding on three orbital planes constitute one core mission. The aim was to have hyperspectral infrared sounding on all three orbital planes, not only am and pm. NOAA noted that there might be an uneven presence of IR Sounders in the mid-morning orbit.

Recommendation 39.01: CGMS agencies are invited to assess the possibility of implementing an IR Sounding in early morning orbit.

CMA indicated its willingness to investigate the possibility of flying an IR Sounder in the early-morning orbit in order to have a better distribution of IR sounding over the planned 3 orbits.

CGMS noted a lack of details on the expected Radio-occultation sensor constellation, and considered that the International Radio-occultation Working Group (IROWG) should provide input on this matter. EUMETSAT indicated that the IROWG would review the status of the global RO system, looking at the different instruments interacting with different GNSS systems (GPS, Galileo and Glonass).

Action 39.03: IROWG to review the status of the global RO system and report to CGMS-40. Deadline: CGMS-40

CGMS Members then:

- adopted the new baseline contained in Annex 6 of the present final report,
- noted that the contingency planning should be updated accordingly.
- confirmed their agreement to contribute with all reasonable efforts to implement their respective contributions to the baseline for CGMS contribution to the GOS,
- invited WMO to proceed with Action 38.42, i.e. to take into account the revised CGMS baseline in the updating process of relevant WMO Manuals and Guides, for submission to CBS-XV in 2012.

It was noted that the baseline could be further updated at future CGMS meetings, to take into account developments which might occur.

In conclusion, WMO thanked CGMS Members for the major step accomplished in adopting this new baseline.

WMO-WP-03 presented the progress of Global Space-based Inter-Calibration System (GSICS) since CGMS-38, including:

- The completion and implementation of algorithms for intercalibration, including routine generation of correction coefficients, of the geostationary infrared imagers from EUMETSAT, JMA, NOAA, and shortly CMA and KMA, using EUMETSAT IASI and NASA AIRS hyperspectral infrared sounders as reference instruments;
- The development and implementation of the GSICS Procedure for Product Acceptance (GPPA) to review and document the GSICS intercalibration and correction algorithms;
- Establishment of the GSICS data servers, wiki pages, and individual operators' web sites for communication and data access;
- The addition of IMD, JAXA, and USGS as full members;
- A range of activities undertaken by the GCC, GRWG and GRDG;
- Feedback from the 3rd GSICS Users' Workshop.

The mission objectives of GSICS are: (i) To provide sustained calibration and validation of satellite observations; (ii) More specifically to intercalibrate critical components of the global observing system to climate quality benchmark observations and/or reference sites; and (iii) to provide corrected observations and/or correction algorithms to the user community for current and historical data. This implies that calibration discrepancies must be quantified (magnitude and uncertainty), diagnosed (root cause) and corrected (empirical removal based on physical interpretation).

The discussion highlighted EUMETSAT's and NOAA's work on intercalibration. It was noted that GSICS was a successful example of international collaboration.

In conclusion, GSICS recommended:

- CGMS Satellite Operators to provide regular information on satellite/instrument events affecting calibration and establish corresponding web sites;
- CGMS Satellite Operators to provide Instrument Performance Monitoring information routinely on their respective web sites;
- CGMS members participating in GSICS to provide a representative in the GDWG;
- CGMS to support the development of guidelines by WMO for the design of future instruments with a view of harmonizing some spectral characteristics (e.g. central λ) of at least some core geostationary imager channels.

Action 39.04: IMD and ROSHYDROMET to present papers at CGMS-40 on progress towards implementing GEO to LEO corrections and instrument bias monitoring as established by NOAA, EUMETSAT, KMA, JMA and CMA. Deadline CGMS-40

Action 39.05: CGMS Members to report at CGMS-40 on activities to implement a web-accessible instrument monitoring website. Deadline CGMS-40

Action 39.06: CGMS Members to send nominations for vice chairmanship for GSICS. Deadline 28 Feb 2012

Action 39.07: CGMS Members to consider hosting GSICS EP-12 meeting in spring 2012 and send proposal to WMO Secretariat. Deadline 31 Dec 2011

WMO thanked CGMS for the fruitful work achieved by the Group.

CMA thanked the chair of GSICS, adding that this work had helped to improve the quality of FY-3 data.

D.2 Inter-regional Contingency Measures

No Working Papers were presented under this item.

D.3 Long-term Global Contingency Planning

No Working Papers were presented under this item.

E. CGMS RESPONSE TO WMO AND OTHER INTERNATIONAL REQUIREMENTS

E.1 Support to WMO Meteorological Programmes and Projects

EUM-WP-40 **presented the status of the EUMETSAT** Network of Satellite Application facilities.

In June 2011, the EUMETSAT Council approved the eight proposals for a second slice of the SAF Continuous Development and Operations Phase (CDOP-2), covering the period 2012-2017. During the CDOP-2, the SAFs will continue to operationally distribute their products, to introduce new products based on data of current satellite programmes, and start preparation of new products based on MTG and EPS-SG data.

The SAF Network Support to the WMO SCOPE-CM initiative progressed well in line with the Plans for the approved Pilot Projects.

JMA-WP-06 outlined the background and mission of the Pilot Project to develop support for NMHSs in satellite data, products and training along with the accomplishments of the second phase, and also details the action plan for the third phase.

The 14th WMO Regional Association II (XIV-RA II) session held in Tashkent, Uzbekistan (from 5 to 11 December 2008) adopted a resolution to establish a Pilot Project for the development of support for National Meteorological and Hydrological Services (NMHSs) in the areas of satellite data, products and training. After the session, the WMO Secretariat invited WMO Members to join the Pilot Project Coordinating Group, whose members were Japan (co-coordinator), the Republic of Korea (co-coordinator), Bahrain, China, Hong Kong (China), India, Kyrgyzstan, the Maldives, Oman, Pakistan, the Russian Federation, Uzbekistan, Vietnam and, as an observer, EUMETSAT (as of 31 May 2011).

KMA-WP-11 outlined the background and mission of the Pilot Project to develop support for NMHSs in satellite data, products and training along with the accomplishments of the second phase, and the action plan for the third phase.

JMA-WP-11 provided a summary of JMA's contributions to the WMO CBS Severe Weather Forecasting Demonstration Project (SWFDP) in RA-II and the Severe Weather Forecasting and Disaster Risk Reduction Demonstration Project (SWFDDP) in RA-V in relation to Recommendation 38.02 from CGMS-38.

JMA's Meteorological Satellite Center (MSC/JMA) provides real-time MTSAT imagery for various areas of RA-II and RA-V via the MSC website. This allows individuals and national weather service providers in these regions to see satellite images of clouds directly on the Internet without the need for a particular image-viewing system.

In addition to this image service, MSC began posting a new satellite product called Imagery with Heavy Rainfall Potential Areas on its website in March 2011 to support the SWFDDP. The product shows areas analyzed to be raining heavily from MTSAT images.

In response to CGMS Actions 38.11, 38.12 and 38.33, and Recommendation 38.02), **WMO-WP-05** gave information about the Severe Weather Forecasting Demonstration Project (SWFDP) which aims to enhance the use of output from existing numerical weather prediction (NWP) systems to improve

severe weather forecasting and warning services in developing countries. While improving the lead-time of alerting severe weather in the medium-range, current experience indicates a gap in the forecasting and provision of warning services of rapidly developing and localised phenomena, such as heavy rain and strong winds associated with convective systems, in the absence of operational radar coverage.

Satellite data is a powerful tool to support very-short range forecasting, including nowcasting. However, there are difficulties in the uptake of new products into weather forecasting daily routines of the forecasters.

The SWFDP strategy for improving the use of satellite data in SWFDP regional subprojects consists of:

- inviting relevant satellite operators to participate in the meetings of the Regional Subproject Management Teams to advise on relevant satellite data and products responding to their needs,
- identifying opportunities for tuning products, developing improved products and services,
- supporting the distribution of data and products for SWFDP regional subprojects;
- working with the WMO/CGMS Virtual Laboratory (VLab) in the development of the satellite aspects of the SWFDP Training programmes and in the delivery of the training.

The SWFDP is currently in progress in four regions: (a) sixteen countries of the southern Africa region ("SWFDP – Southern Africa"); (b) nine countries of the South Pacific Islands ("SWFDP – South-west Pacific"); (c) six countries of the Eastern Africa region ("SWFDP-Eastern Africa"); and (d) four countries of Southeast Asia ("SWFDP – Southeast Asia). Other projects are in consideration or development (e.g. in Bay of Bengal; Central Asia; Central America and the Caribbean).

Action 39.08: CGMS Members to provide a contact point to WMO to coordinate their potential contributions to SWFDP (Severe Weather Forecasting Demonstration Project). Deadline: CGMS-40

Recommendation 39.02: CGMS Satellite Operators are invited to support the strategy for improving the use of satellite data in SWFDP regional subprojects.

WMO-WP-04 gave an overview of the development of the Implementation Plan for the Evolution of Global Observing Systems (EGOS-IP), which is a major component of the Rolling Requirements Review (RRR) process.

The new version of EGOS-IP is structured as a response to the Vision for the GOS in 2025, but it also aims to respond to the Implementation Plan for the Global Climate Observing System (GCOS-IP), and to emerging requirements of the Global Framework for Climate Services (GFCS) and of the Global Cryosphere Watch (GCW). Its purpose is to document a set of implementation actions which are required for incremental improvement of global observing systems towards the 2025 Vision.

The scope of EGOS-IP embraces space and surface-based observation, as well as cross-cutting considerations. The Expert-Team on Satellite Systems (ET-SAT) completed a thorough review of the satellite-related aspects of this plan. The comments from ET-SAT have been taken into account in the current version (v.10), which is available under: ftp://ftp.wmo.int/Documents/PublicWeb/www/gos/egos-ip/ .

The plan will be finalized for submission to the Commission for Basic Systems in September-October 2012.

WMO-WP-06 reported on Remote Sensing of Volcanic Ash and other Aerosols for Aeronautical Meteorology, which has traditionally concerned itself with both meteorological hazards and phenomena impacting the regularity and economy of civil air navigation. Of these hazards, several are linked to aerosols such as volcanic ash, supercooled water droplets and ice, which affect the safe operation of engines, dynamic sensors such as Pitot-tubes and electric/electronic components of aircraft systems. New airspace concepts, increased air traffic and higher safety standards needed to maintain or improve safety under increased traffic loads require higher temporal and spatial resolution, accuracy and additional elements to be quantitatively observed on a global basis.

While in-situ and ground-based remote sensing systems are capable of providing highly accurate and reliable data of such aerosols locally, space-based systems are paramount to ensuring a near-global availability of these data considered crucial for the safety of air transport. In view of evolving needs, gaps are identified on current observation systems in particular for the vertical distribution of hazardous aerosols. It is suggested to aim at harmonizing imager characteristics, to implement as soon as possible the next generation geostationary platforms with enhanced multispectral capabilities, and to consider the deployment of operational LIDAR sensors in LEO. Cooperation between the satellite community and ground-based and airborne system operators is encouraged with a view of establishing a composite observing system for ash density and ice loading.

Cooperation with international organisations and initiatives to ensure a common understanding of user requirements and coordinated implementation strategies is also encouraged. In that regard, ICAO, in partnership with WMO, supports the following recommendations:

Recommendation 39.03: Satellite operators are asked to strive to harmonise the spectral characteristics of future Visible and Infrared imager channels in order to enable seamless application of differential absorption methods to data acquired from different platforms.

Recommendation 39.04: CGMS Satellite operators are asked to ensure the earliest possible deployment of next generation geostationary platforms with enhanced multi-spectral VIS-IR capabilities.

Recommendation 39.05: CGMS Satellite operators are asked to consider the deployment of operational LIDAR sensors in Low Earth Orbit to provide multi-daily coverage over global air routes.

E.2 Support to GCOS and other Climate Monitoring Activities

EUM-WP-15 provided information on activities of the EUMETSAT Secretariat for the generation of Climate Data Records (CDRs) within its distributed ground segment. This includes progress in the development of the reprocessing facilities and an update of reprocessed data at the Central Application Facilities (CAF) at its Headquarters. It also highlighted EUMETSAT's role in related international Climate Monitoring activities.

Cornerstones in 2010/2011 were the progress in the establishment of dedicated reprocessing facilities at the CAF, progress in GSICS and SCOPE-CM, the start of the EU FP7 ERA-CLIM project and the support to ESA-CCI. In addition the EUMETSAT Satellite Application Facilities Network (SAFs) offers an extended commitment with respect to the generation of Climate Data Records (CM SAF and other SAFs).

EUMETSAT also participated in international discussions on data set assessments and acknowledges the importance of those for establishing information on the reliability of existing and upcoming Climate Data Records. EUMETSAT supports assessment work within the SAF network and the CAF and also proposes steps to include data set assessments as a mandatory item in the data set release process in SCOPE-CM.

In **ESA-WP-03** CGMS was informed about the status of the Earthwatch Programme Element, Global Monitoring of Essential Climate Variables (also known as the 'ESA Climate Change Initiative').

WMO thanked both EUMETSAT and ESA for their contributions to creating satellite-based climate data records.

EUMETSAT, on behalf of the CGMS Secretariat, responded to Action 38.05 and introduced **EUM-WP-41**, as requested by the Chairman of the Drafting Team of the Strategy for developing an architecture for Climate monitoring from Space. The Chairman of the Drafting Team indicated that he expects to receive consolidated written comments on the report from CGMS by the end of November 2011 so that it could undertake a further revision of the report to be completed by the end of Q1 2012.

This document presented the draft version of the "Strategy Towards an Architecture for Climate Monitoring from Space" which has been developed by a drafting team in response to an initiative started by WMO at the 10th session of the WMO Consultative Meeting on High Level Policy on Satellite Matters (CM-10) in January 2010.

Following the introduction of the document, CGMS Members were invited to comment on:

- The general approach taken by the Drafting Group for establishing a climate architecture;
- The proposed way forward (see section 8 of the attached document) which includes the development of an initial physical architecture within the framework of the current "informal" Drafting Group;
- The commitment of CGMS Members in contributing to the elaboration of the initial physical architecture (and the related steps);
- Any other topic of interest to CGMS Members.

During the discussion of the document, GCOS supported the initiative and considered that the overall approach taken was correct. CGMS Members agreed that the proposed architecture was comprehensive and that all functions and goals presented in the document are agreeable to CGMS Members.

CGMS also considered that the logical model might need to link with entities in charge of re-analysis, i.e ECWMF in Europe, as they might have special requirements to be considered.

CGMS Members noted that the Drafting Team in its current composition will now finalise a version of the architecture document by first quarter 2012. After release of the final version of the document, the Drafting Team might have to evolve to start the elaboration of the physical architecture. CGMS Members were encouraged to designate participants to the Drafting Team or to its follow-on, whatever the form would be.

The Chairman insisted on the need for CGMS Members to commit to the architecture and encouraged them to already start listing what could be individual agency's contributions to the physical architecture. He also suggested that detailed contributions to the architecture be reported at the 40th CGMES Plenary meeting.

As a way forward, CGMS Members agreed on a set of actions:

Action 39.09: CGMS Executive Secretariat to request the Architecture Writing Team to provide a template to be used by CGMS Members to provide elements / activities which might contribute to the physical global architecture for Climate Monitoring. Deadline: End of Q1 2012.

Action 39.10: CGMS Members to provide a detailed review of current and future plans to contribute to the global architecture for Climate Monitoring at CGMS-40. Deadline: CGMS-40

Action 39.11: CGMS Members who are interested in joining the Writing Team on global architecture for climate monitoring to nominate participants by end of November 2011.

Action 39.12: CGMS Members are invited to send comments on the global architecture for climate monitoring to the Secretariat and CGMS Secretariat to send an official CGMS response on the Writing Team Report to the Writing Team Chair prior to the CEOS Plenary by end of October 2011. Deadline: 31 October 2011.

Noting the overall support of CGMS to the architecture document, CGMS Members requested the Secretariat to report on the outcome of the discussion at the upcoming CEOS Plenary meeting.

WMO-WP-08 reported on the outcome of the sixteenth World Meteorological Congress (Cg-XVI), which agreed that an architecture for sustained climate monitoring from space should be defined and implemented, involving different stakeholders including operational satellite operators and R & D space agencies, the CGMS, the Committee on Earth Observation Satellites (CEOS), the Global Climate Observing System (GCOS), the World Climate Research Programme (WCRP) and the Group on Earth Observations (GEO). WMO Congress provided guidelines for the development of such an architecture, and adopted Resolution 19 (Cg-XVI). The first outcome of the collaborative work done on this subject was presented at CGMS-39 by the CGMS Secretariat in EUMETSAT WP-41. As a partner in this effort, WMO is looking forward to broad support from CGMS on this matter.

NOAA-WP-11 was in response to recommendation R.38.03.The Center for Satellite Applications and Research (STAR) is the science arm of NESDIS and conducts research and develops algorithms for operational utilization for weather, environmental, and climate applications. STAR scientists have been active in the IPWG, IWWG, ITWG, IROWG and WCRP GEWEX RP.With respect to human resources, STAR scientists regularly attend these working groups, and have hosted some of the meetings, and chaired the working groups, notably IPWG, IWWG and ITWG. STAR scientists also are rapporteurs to ITWG and IROWG. Furthermore, STAR, GOES-R and JPSS have provided some financial support for holding the meetings. STAR is also active in WCRP observation and assimilation (WOAP) and has participated in the various subgroups of GEWEX, - Clouds, Precipitation, Radiation and Aerosols. With respect to climate data records (CDRs), STAR produce a number of CDRs, including the atmospheric MSU/AMSU temperature time series, SBUV/2 ozone time series, the SSMIS hydrology product time series (precipitation, water vapour, snow and ice cover), AVHRR product suite time series (includes clouds, vegetation, sea surface temperature). NOAA participates in the SCOPE-CM program. Our scientists collaborate with other scientists developing similar products through projects with EUMETSAT and ESA. At NOAA, NCDC has a climate data records program that includes participation from STAR and the research community, and workshops are held to promote peer review of CDRs.For ozone products, NOAA works closely with the NASA, KNMI and EUMETSAT. These agencies are also involved in the CEOS Atmospheric Composition Constellation.

WMO-WP-07 gave an overview on the latest activities related to the objectives of the GCOS programme:

- Implementation Plan for the Global Observing System for Climate in support of the UNFCCC (2010 update) and its up-dated satellite supplement in 2011;
- The evaluation of satellite-related global climate data sets;
- The «GCOS Improvement and Assessment Cycle»;
- System improvement – Support of in situ networks as ground truth for space based observations;
- Facilitate regional and national implementation of the global observing system for climate.

E.3 Support to IOC, JCOMM and other Ocean Monitoring Activities

IOC-UNESCO-WP-01 reported on sea surface temperature for numerical weather prediction. The atmosphere and oceans are joined together over seventy percent of Earth, with sea surface temperature (SST) one of the linkages. Sustained satellite SST

measurements are critical for weather and climate applications. Small-scale SST gradients produced wind divergence and wind stress curl throughout the global marine atmospheric planetary boundary layer. Strong SST gradients enhanced deep convection throughout the troposphere. The international Group for High Resolution Sea Surface Temperature is working to improve the accuracy and resolution of SST used in atmospheric general circulation models, including numerical weather prediction models.

IOC invited all CGMS Members to continue providing scatterometer information necessary to observe sea surface winds.

Action 39.13: IOC is invited to prepare a paper on guidance to CGMS members on ocean wind measurements.

E.4 Support to GAW and other atmospheric chemistry monitoring activities

WMO-WP-09 reported that the sixteenth session of the WMO Congress recommended that the Global Atmospheric Watch (GAW) set up an ad-hoc Task Team to review the needs for GAW regarding satellite measurements. WMO Congress further recommended that taking into consideration the GCOS requirements and the vision for the GOS in 2025, this work should be done in coordination with the CBS Expert Team on Satellite Systems (ET-SAT) and the Expert Team on Evolution of the global observing systems (ET-EGOS), the Committee on Earth Observation Satellites (CEOS) Atmospheric Composition Virtual Constellation team and CGMS. Congress highlighted that the required coverage, precision, spatial and temporal resolution called for geostationary and low earth orbit observation capabilities to be implemented and sustained. Congress also requested WMO Members operating satellites to include atmospheric sensors of proven capability aboard future spacecraft, and to maintain continuous atmospheric composition measurements for as long as possible, making a selection of data available to all interested users. Congress recognized that such remote sensing observations are meaningful when they are combined with the in-situ observations to produce global three dimensional high resolution and high quality products. CGMS was informed that the ad-hoc task team will be established towards the end of 2011 and will hold its first meeting in 2012.

E.5 Support to Satellite Requirements of other International Programmes

WMO-WP-10 provided a satellite-specific update on the planned implementation of the Global Cryosphere Watch (GCW). The involvement of satellite agencies is a precondition for a successful GCW. It has to be clear that in the Polar Regions and the "Third Pole" - the Himalaya and the Tibetan Plateau (HKH - Himalaya-Karakoran-Hindukush), the required density of observations could not be reached without satellite observations. Role of the satellite agencies can be seen in the GCW Implementation Strategy. A special attention in the initial stage should be put on the GCW Initial Implementation Tasks (paragraph 5.2 of the Strategy), in particular the Inventory of Satellite Data Products. Developing an inventory of candidate satellite products for GCW which are mature and generally accepted by the scientific community is a key element contributing to GCW implementation. This task includes an intercomparison of products to assess quality and to ensure an authoritative basis. The Polar Space Task Group of the Executive Council Panel of Experts on Polar Observations, Research and Services (EC-PORS), with its direct connection to Space Agencies, will work to identify new satellite products to support GCW pilot projects and services.

Recommendation 39.06: CGMS members are invited to ensure, as appropriate, their involvement in the Polar Space Task Group in support of the WMO Global Cryosphere Watch (List of invitees to first meeting 13-14 October 2011 in Geneva, Switzerland: http://www.wmo.int/pages/prog/sat/meetings/documents/PSTG-1_Inf_02_%20Invitees.pdf)

NOAA-WP-12 provided information to CGMS-39 on activities at NOAA/NESDIS/STAR with respect to the new WMO Global Cryosphere Watch (GCW). The paper presented a brief background to GCW and a description of potential contributions from CGMS members.

WMO-WP-11 reported that the World Climate Research Programme (WCRP) Observation and Assimilation Panel (WOAP) held a workshop to prepare a technical report on the evaluation of global climate datasets at European Space Agency (ESA) ESRIN in Frascati, Italy on 18-20 April 2011. Eight satellite-related Essential Climate Variables (ECVs) from the atmospheric, oceanic and terrestrial domains were considered. From consideration of the evaluated ECV datasets, it was concluded that special attention needs to be given to the following issues: observing strategies for ECVs, reprocessing of FCDRs, atmospheric correction for satellite retrievals, independent expert-group assessment of datasets, indices of maturity and uncertainty, interdependence of variables and long-term homogeneity of datasets.

Recommendation 39.07: CGMS is invited to note the outcome of the 2011 WOAP workshop, in particular in the context of the development of an architecture for climate monitoring from space.

WMO-WP-12 announced that the World Climate Research Programme (WCRP) will hold an International Conference on Reanalyses from 7-11 May 2012 in Silver Spring, Maryland, USA. Reanalyses represent a method of integrating satellite and in situ observations with models to produce continuous fields of global weather and climate data. Over the last 20 years, reanalyses have been a significant source of data for many studies of the atmosphere and ocean circulations at time scales from hours to decades. The data assimilation systems have improved over time with better models, data assimilation techniques and computer advances. New generations of reanalyses are providing higher resolution, more detailed output for diagnostic analysis and coupling between components of the Earth system. Since observations are an essential element of reanalyses, remote sensing represents a critical input to the reanalysis efforts worldwide. In turn, the remote sensing community may exploit the reanalysis products for remote sensing product validation and comparison.

WMO-WP-13 reported that the Space Programme Office had recently completed the new Observing Requirements Database. It is available under: www.wmo-sat.info/db. It provides a publicly accessible repository for requirements of WMO and co-sponsored Programmes.

This new database features:

- Revised list of variables with agreed definitions and units following a consultation of the various application communities;
- Enforcement of consistent variable naming and units;
- Improved consultation/navigation functionalities;
- Online editing capability (for authorized editors).

In parallel, a call has been made to designated points of contact of all application areas to review and update the requirements pertaining to their respective areas.

CGMS noted the progress made in providing an improved user -friendly interface for consulting and updating requirements for observation, as well as in updating the content, which should make this database a useful tool for the planning and assessment of observing systems.

F. INTERACTION WITH INTERNATIONAL PARTNERS

F.1 GEO

No working papers were submitted under this item.

F.2 CEOS

No working papers were submitted under this item.

F.3 Other International Partners

EUM-WP-17 provided information to CGMS on the European initiative Global Monitoring for Environment and Security (GMES) and in what way EUMETSAT is involved and how its satellite programmes play a highly relevant role in the initiative.

G. WORKING GROUP REPORTS

Reports from the four working groups were presented by Mr Marlin O. Perkins (WGI on Telecommunications), Dr Johannes Schmetz (WG II on Satellite Products), Mr Jérôme Lafeuille (WG III on Global Contingency Planning) and Mr Mikael Rattenborg (WG IV on Global Data Dissemination). Please see pages 98-162 inclusive for the detailed Working Groups reports.

CGMS-39 took note of the reports and thanked the Working Group participants, Chairmen and Rapporteurs for their active and fruitful discussions.

WG I
WMO thanked WG I Members for their participation and highlighted the importance of the WG I activity in the context of frequency protection.

WG II
ROSHYDROMET thanked the chairmen and rapporteurs of WG II

WG IV
EUMETSAT noted that in the future, CGMS might need to consider access to satellite data though

X-band receiving stations and encouraged WMO to look at this issue.

CGMS-39 endorsed the proposed actions and recommendations formulated by each Working Group and congratulated the four Groups for their comprehensive reports and for their achievements since the preceding meeting of CGMS.

H. OTHER ITEMS OF INTEREST

H.1 Training

EUM-WP-18 described the status and future plans for training in satellite meteorology provided by EUMETSAT and the Centres of Excellence (CoE) in Africa, the Middle East and Europe.

EUM-WP-31 summarised the regular training activities in support of the WMO SDS-WAS project, which are supported by EUMETSAT, the Barcelona Supercomputing Center, AEMET, WMO and several host institutes. In 2010, a two-week training course involving representatives of 22 countries in Africa and the Middle East took place in Barcelona. In 2011, the second course of this series is planned for 21 – 25 November 2011 in Antalya (Turkey), organised by the Turkish State Meteorological Service together with the above mentioned supporting partners.

NOAA-WP-13 provided a summary of NOAA Support for the WMO Virtual Laboratory, Virtual Laboratory Management Group (VLMG), the Environmental Satellite Resource Center (ESRC), and Focus Groups from September 2010 through September 2011.

WMO-WP-14 reported on training activities within the Virtual Laboratory for Education and Training in Satellite Meteorology (VLab) along with future plans and directions. Important developments have taken place since CGMS-38, including the recognition of the new Centre of Excellence (CoE) in Jincheon, Republic of Korea; the organising of the Aviation Week; and the launching of the shared online calendar of training events and the new VLab website. The Technical Support Officer (TSO) has efficiently supported the various activities and further advanced the objectives of the VLab along the lines of the five-year strategy, but a solution needs to be identified to fund its position in the long run, since funding is currently only secured until December 2011.

A summary of the annual reports from the CoEs for the period from July 2010 to August 2011 is given in this status report.

CGMS noted the important achievements of the VLab and adopted the actions and recommendations below.

Action 39.14: GMS Satellite Operators to update their web pages to include the VLab logo and to more clearly show their support to VLab activities and CoEs. Deadline: CGMS-40.

Recommendation 39.08: CGMS Members are invited to include links to the VLab Calendar of Events and the ESRC.

Action 39.15: CGMS Satellite Operators, in their areas of responsibilities, should be ready to make a contribution towards funding of VLab Management Group (VLMG) members to attend the VLMG-6 in Brazil in September 2012. Deadline: CGMS-40

Action 39.16: CGMS Satellite Operators to report to WMO Space Programme and CGMS Secretariat within 2 weeks, regarding the possibility to financially support the continuity of employment of the VLab Technical Support Officer (TSO). Deadline: 31 October 2011.

WMO thanked CGMS for the support provided for the VL Training Support Officer (TSO) and expressed the wish that all CGMS members would pool resources to ensure continued support for this function.

WMO-WP-15 reported on new material being developed by WMO with the aim to replace the current Chapter on Satellite Observations in the Guide to Meteorological Instruments and Methods of Observation (CIMO Guide). Given the increasing importance of space-based observations to WMO Members, it would be a new part entirely dedicated to space, considerably enhancing the existing material (more than 160 pages instead of 38 pages).

It is recalled that the CIMO Guide is an official WMO Publication (WMO-No. 8), which serves as a reference for all WMO Members. Taking into account the final editing and approval process, its updating cycle is typically several years. The CIMO Guide is thus complementary to the Dossier on the Space-based GOS and other web-based information, which can be more frequently updated and are more detailed.

The CIMO Guide should provide an introduction to

the fundamental principles and the main features of different space-based observation techniques. It should raise the technical awareness of WMO Members, help them to understand the advantages and limitations of space-based observations highlight e.g. the importance of calibration and validation, and guide them in the use of satellite data and products.

CGMS members were informed that the material prepared for the CIMO guide is currently under review by the Expert Team on Satellite Systems (ET-SAT).

The draft text can be found at:
http://www.wmo.int/pages/prog/sat/meetings/documents/ET-SAT-6_Doc_08-01_add-CIMO-Guide.zip

H.2 Information

EUM-WP-20 gave a brief summary of conferences and events which have taken place since CGMS-38 and lists those which are foreseen in the short- to medium-term.

EUMETSAT's recent and current publications, as well as those in preparation, are also listed.

JMA-WP-09 detailed the second Asia/Oceania Meteorological Satellite Users' Conference to be held from 6 to 9 December, 2011, in Tokyo, Japan. The event follows in the footsteps of the First Asia/Oceania Meteorological Satellite Users' Conference hosted by CMA in November 2010 in Beijing, China. The purposes of the conference are to further enhance exchanges on application techniques among satellite data users, to advance satellite observation technologies, and to promote synergetic development in the field of meteorological satellites.

In June 2011, JMA issued the first announcement/call for papers and launched the conference website. The event will involve several sessions at which presentations on a range of scientific matters will be made and related discussions will be held by a variety of satellite experts.

WMO highlighted that this conference is the equivalent to the EUMETSAT conference in Europe. The regional dimension of these conferences is key and CGMS Members were invited to participate in this important conference.

CMA thanked JMA for organising this conference and CGMS members for their support.

WMO-WP-16 reported on the WMO Dossier on the Space-based Global Observing System in 2011. Incorporating the latest information provided by satellite operators, it is available for review by CGMS Members.

The GOS Dossier comprises an introduction followed by five volumes:

- Vol. 1 Satellite programmes description

- Vol. 2 Earth observation satellites and their instruments

- Vol. 3 Gap analysis in the space-based component of GOS

- Vol. 4 Estimated performance of products from typical satellite instruments

- Vol. 5 Compliance analysis of potential product performances with user requirements

The Dossier is available for download from the "Information Resources" page of the new WMO Space Programme web site (www.wmo.int/sat). This issue of the GOS Dossier includes several substantial changes, some structural, with respect to the version submitted to CGMS-38. The main changes are indicated in the text that follows.

ROSHYDROMET thanked WMO for this work which is a reference for many scientists.

WMO encouraged CGMS Members to populate the database in order to keep it up to date.

Permanent Action 07: WMO to maintain the Dossier on the Space-based GOS, with review by the relevant Expert Teams, and inform CGMS of major updates.

Permanent Action 08: CGMS Members to provide WMO with the update of their programmes for the dossier on the space-based GOS.

Action 39.17: CGMS Satellite Operators are invited to note GOS-2011-September edition of the dossier and to forward to WMO (bibizzar@tin.it) any update or missing information concerning their programmes for inclusion in GOS-2012-January. Deadline: 31 January 2012.

H.3 Any other Business

KMA-WP-12 provided an update on the project for development of COMS data receiving/analysis system in Sri Lanka. Additionally KMA will expand support to Asia-Pacific countries with a weather analysis system as well as a COMS data receiving system.

NASA-WP-08 reported on Operational Use of NASA Research Satellite Data.

Climate change is a defining issue of our generation. Our responses to the challenges of climate change - accurate prediction, equitable adaptation, and efficient mitigation - will influence the quality of life for the nation, and indeed the world, for generations to come. As NASA continues to address pressing scientific and national issues associated with climate change and the nation's climate research and monitoring capabilities, it is also apparent that quantitative short-range earth-system prediction has wide-ranging operational applications and provides very large benefits to society, both in terms of protection of life and property and in terms of direct and indirect contributions to nearly all sectors of the economy.

WMO-WP-18 provided a top-level summary of the outcome of a questionnaire that WMO distributed in 2010 among its 189 Members on the availability and use of satellite data and products for the period 2008-2009. WMO has been using biennial questionnaires to establish evidence on the capabilities and possible existing deficiencies on the part of users. This analysis of the outcome was based on 100 responses from 86 countries.

A key motivation for users to respond to the questionnaire lies in the expectation that remedial action will be taken by satellite operators, processing centres and training facilities, helping to mitigate some of the reported deficiencies and unmet requirements in the following areas: access to satellite data; use of satellite data and products; applications of satellite data and products; training in satellite meteorology; other requirements. CGMS as a coordination forum of satellite operators is a key recipient of these results. The full report with an analysis of the biennial questionnaire is available at: http://www.wmo.int/pages/prog/sat/documents/SAT-PUB_SP-8-TD-1567-Questionnaire-Outcome-2010.pdf.

The session noted the key outcomes of the biennial questionnaire.

ESA-WP-04 provided a response to Action 37.04: ESA to inform CGMS whether the soil moisture information derived from SMOS data is comparable to that derived from Scatterometer data. The physics of the measurements performed with the passive L-band interferometer on-board SMOS and with the active C-band scatterometer on-board MetOp are fundamentally different. Any "direct" comparison of the information on soil moisture derived from those sensors must take this difference into consideration. However the comparison of the first year of SMOS Level 2 data with the corresponding Level 2 ASCAT measurements shows how close the two data sets often are to each other. Of course, over some regions (e.g. over deserts) SMOS and ASCAT do not compare well, but it seems that it will be possible in the near future to start merging SMOS L2 products into all the other L2 data sets.

Noting the upcoming 40th anniversary of CGMS in 2012, **NOAA-WP-35**, proposed CGMS to evaluate its structure, meetings and practices to maximize its effectiveness and relations with other coordinating bodies and the global meteorological satellite community.

EUMETSAT supported the approach, insisting on the need to keep the technical nature of CGMS and its responsiveness through WMO.

ESA, NASA, ROSCOSMOS, CNSA, JAXA, IOC and CSA also supported the approach.

WMO considered that this might leverage on CEOS self-study and stressed the need to keep the technical nature and the international cooperation framework of CGMS.

Action 39.18: Interested CGMS Members to nominate a participant in the CGMS Internal Study Task Force in charge of reviewing CGMS structure, meetings and practices for next meeting. Deadline: 31 October 2011

Action 39.19: CGMS Members to review and approve the report of the CGMS Internal Study Task Force by April 2012 so that it could be implemented for CGMS-40. Deadline: 15 April 2012.

I. FINAL SESSION

I.1 Nomination of CGMS Representatives at WMO, CEOS and other meetings

CGMS-39 agreed that the CGMS Secretariat (EUMETSAT) would represent CGMS at:

- CEOS Plenary and relevant CEOS meetings
- GOE-VIII
- Extraordinary WMO Congress
- CBS

I.2 Nomination of Chairmen and Rapporteurs of Working Groups for CGMS-40

- **Working Group I on Telecommunications** will be chaired by Mr Marlin O Perkins,NOAA, with Mr Joaquin Gonzalez, EUMETSAT, as Rapporteur;

- **Working Group II on Satellite Products** will be co- chaired by Dr Stephan Bojinski, WMO and Dr. Vaddi RAJESWARA RAO, IMD with Dr Johannes Schmetz, EUMETSAT and Dr Mitch Goldberg, NOAA, as rapporteurs;

- **Working Group III on CGMS Global Contingency Planning** will be chaired by Mrs Suzanne Hilding,NOAA, with Mr Jérôme Lafeuille, WMO, as Rapporteur;

- **Working Group IV on Globa data dissemination** will be chaired by Mr Mikael Rattenborg, EUMETSAT, with Mr Gordon Bridge. EUMETSAT, as Rapporteur.

I.3 Nomination of Rapporteurs of IPWG, IROWG, ITWG, IWWG

International Precipitation Working Group (IPWG): Dr Volker Gärtner

International Radio Occultation Group: Dr Mitch Goldberg

International TOVS Working Group (IWWG): Dr Mitch Goldberg

International Winds Working Group: Dr Johannes Schmetz

I.4 List of Actions from CGMS-39

Actions open from CGMS-37 and CGMS-38 (at CGMS-39)					
Actionee	**Action**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**
WMO	37.14	Action 37.14: WMO to continue dialogue with ISRO regarding the establishment of an Indian CoE and the co-sponsoring of the CoE in Oman. Deadline: CGMS-39	CGMS-39 WMO-WP-14; CGMS-39 NOAA-WP-13 On going	(CGMS-38) New Deadline: CGMS-40	OPEN
ESA	WGII 37.28	Action 37.28: ESA to provide a working paper on the long-term monitoring of MERIS as a reference calibration instrument. Deadline: CGMS-39	Paper in Preparation, will be delivered in 02/2012, new deadline CGMS-40	(CGMS-38) New Deadline: CGMS-40	OPEN
NOAA and IMD	WGII 38.36	Action 38.36: NOAA and IMD to better understand differences in TC intensity estimations and to inform CGMS members on the outcome. Deadline: CGMS-39.	New deadline CGMS-40	CGMS-40	OPEN
WMO	WGIII 38.40	Action 38.40: WMO in collaboration with the atmospheric composition community and satellite experts to further refine the requirements for atmospheric composition requirements and the optimal way to address these in the revised baseline.	29/09/2011 WMO: ongoing, see WMO-WP-09	CGMS-40	OPEN
WMO	WGIII 38.42	Action 38.42: WMO to take into account the revised CGMS baseline for the space-based component of the GOS in the updating process of relevant WMO Manuals and Guides, with a view of its endorsement by CBS-XV in 2012.	Shall be completed, based on the outcome of CGMS-39, will start after plenary	CGMS-39	OPEN

CGMS-39 permanent actions					
Actionee	**Action**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**
CGMS Members	Permanent 01	All CGMS Members to inform the Secretariat of any change in the status or plans of their satellites to allow the updating of the CGMS Tables of Satellites (tables 1-6 of the plenary report). The Secretariat to publish this updated information in the CGMS report and, via WMO, in the WMO CGMS satellite status web pages.	EUM-WP-02, NOAA-WP-02, -03, -04, -07, -08, -19, -35, -40, -43	CGMS-40	OPEN
CGMS satellite operators	Permanent 02	CGMS Members to report to CGMS plenary on their activities and plans related to space weather including: (i) impact of solar events and space radiation on satellites, protective measures, (ii) space weather observations, and (iii) space weather warning services.	EUM-WP-05, NOAA-WP-05	CGMS-40	OPEN
CGMS Members	Permanent 03	CGMS Members to review the list of available list servers used by CGMS groups and update as appropriate.		CGMS-40	OPEN
IOC/ CGMS Members	Permanent 04	CGMS satellite operators to consider the IOC satellite requirements, especially the data dissemination methods, bearing in mind the ongoing formations of GOOS Regional Alliances (GRAs).		CGMS-40	OPEN
CGMS Members	Permanent 05	CGMS should develop a coordinated approach for direct broadcast services of future polar orbiting meteorological satellite systems.		CGMS-40	OPEN
CGMS Members	Permanent 06	All CGMS satellite operators to regularly include user statistics in their reports on current satellite systems. Deadline: CGMS-39.		CGMS-40	OPEN
WMO	Permanent 07	WMO to maintain the Dossier on the Space-based GOS, with review by the relevant Expert Teams, and inform CGMS of major updates.		CGMS-40	OPEN

CGMS-39 permanent actions					
Actionee	**Action**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**
CGMS Members	Permanent 08	CGMS Members to provide WMO with the update of their programmes for the dossier on the space-based GOS.		CGMS-40	OPEN
EUMETSAT	Permanent 09	EUMETSAT, as CGMS Secretariat, to provide a yearly report to WG-I on the annual SFCG meeting.		CGMS-40	OPEN
CGMS Members	Permanent 10	CGMS Members to provide at every CGMS meeting a list of frequencies used by their current and future systems in the format provided in WG I report-39 (Annex 1).		CGMS-40	OPEN
WMO	Permanent 11	WMO to report on coordination efforts between Radio Occultation data providers and NWP agencies to establish long term continuity plans for the use of both operational and research RO data in Numerical Weather Prediction and climate models.	From Action 38.30: WMO stressed that it was a long-term action, initiated through participation in NAEDEX-APSDEU meetings. CGMS-39 agreed to convert in a permanent action to report on such coordination.	CGMS-40	OPEN

CGMS-39 actions					
Actionee	**Action**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**
CGMS Members	39.01	Action 39.01: Interested CGMS members to contact NOAA for assistance in obtaining conjunction warning support from the U.S. Joint Space Operations Center (JSpOC). Deadline: CGMS-40		CGMS-40	OPEN
WMO	39.02	Action 39.02: WMO, through ICTSW, to propose a template in advance of CGMS-40 in order to facilitate harmonised reporting on spacecraft anomalies related to space weather. Deadline: 1 May 2012		01-May-12	OPEN
IROWG	39.03	Action 39.03: IROWG to review the status of the global RO system and report to CGMS-40. Deadline: CGMS-40		CGMS-40	OPEN
IMD and ROSH	39.04	Action 39.04: IMD and ROSHYDROMET to present papers at CGMS-40 on progress towards implementing GEO to LEO corrections and instrument bias monitoring as established by NOAA, EUMETSAT, KMA, JMA and CMA. Deadline: CGMS-40		CGMS-40	OPEN
CGMS Members	39.05	Action 39.05: CGMS Members to report at CGMS-40 on activities to implement a web-accessible instrument monitoring website. Deadline: CGMS-40		CGMS-40	OPEN
CGMS Members	39.06	Action 39.06: .CGMS Members to send nominations for vice chairmanship for GSICS. Deadline: 28 Feb 2012		28-Feb-12	OPEN
CGMS Members	39.07	Action 39.07: CGMS Members to consider hosting GSICS EP-12 meeting in Spring 2012 and send proposal to WMO Secretariat. Deadline: 31 Dec 2011		31-Dec-11	OPEN

CGMS-39 actions					
Actionee	**Action**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**
CGMS Members	39.08	Action 39.08: CGMS Members to provide a contact point to WMO to coordinate their potential contributions to SWFDP (Severe Weather Forecasting Demonstration Project). Deadline: CGMS-40		CGMS-40	OPEN
CGMS Members	39.09	Action 39.09: CGMS Executive Secretariat to request the Architecture Writing Team provide a template to be used by CGMS Members to provide elements / activities which might contribute to the physical global architecture for Climate Monitoring. Deadline: end of Q1 2012		31-Mar-12	OPEN
CGMS Members	39.10	Action 39.10: CGMS Members to provide a detailed review of current and future plans to contribute to the global architecture for Climate Monitoring at CGMS-40 Deadline: CGMS-40		CGMS-40	OPEN
CGMS Members	39.11	Action 39.11: CGMS Members who are interested in joining the Writing Team on global architecture for climate monitoring to nominate participants by end of November 2011.		30-Nov-11	OPEN
CGMS Members/ CGMS Secretariat	39.12	Action 39.12: CGMS Members are invited to send comments on the global architecture for climate monitoring to the Secretariat and CGMS Secretariat to send an official CGMS response on the Writing Team Report to the Writing Team Chair prior to the CEOS Plenary by end of October 2011. Deadline: 31 October 2011		31-Oct-11	OPEN
IOC	39.13	Action 39.13: IOC is invited to prepare a paper on guidance to CGMS members on ocean wind measurements.		CGMS-40	OPEN
CGMS Satellite Operators	39.14	Action 39.14: CGMS Satellite Operators to update their web pages to include the VLab logo and to more clearly show their support to VLab activities and CoEs. Deadline: CGMS-40		CGMS-40	OPEN
CGMS Satellite Operators	39.15	Action 39.15: CGMS Satellite Operators, in their areas of responsibilities, should be ready to make a contribution towards funding of VLab Management Group (VLMG) members to attend the VLMG-6 in Brazil in September 2012. Deadline: CGMS-40		CGMS-40	OPEN
CGMS Satellite Operators	39.16	Action 39.16: CGMS Satellite Operators to report to WMO Space Programme and CGMS Secretariat within 2 weeks, regarding the possibility to financially support the continuity of employment of the VLab Technical Support Officer (TSO).		31-Oct-11	OPEN
CGMS Satellite Operators	39.17	Action 39.17: CGMS Satellite Operators are invited to note GOS-2011-September edition of the dossier and to forward to WMO (bibizzar@tin.it) any update or missing information concerning their programmes for inclusion in GOS-2012-January		31-Jan-12	OPEN
CGMS Members	39.18	Action 39.18: Interested CGMS Members to nominate a participant in the CGMS Internal Study Task Force in charge of reviewing CGMS structure, meetings and practices for next meeting. Deadline: 31 October 2011		31-Oct-11	OPEN
CGMS Members	39.19	Action 39.19: CGMS Members to review and approve the report of the CGMS Internal Study Task Force by April 2012 so that it could be implemented for CGMS-40.		15-Apr-12	OPEN

CGMS-39 actions					
Actionee	**Action**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**
CGMS Members	WGI 39.20	Action 39.20: CGMS Members to report on their plans for the utilisation of the band 7750-7850/7900 MHz for their existing and future LEO systems (including the detailed list of frequencies used in the band, associated bandwidth and signal characteristics - together with the orbital parameters). Deadline: 31 Dec.2011		31-Dec-11	OPEN
CGMS Members	WGI 39.21	Action 39.21: Based on the inputs of the previous action, CGMS members to analyse potential interference issues, reporting results of analysis back to CGMS WG-I by next CGMS meeting. Deadline: CGMS-40		CGMS-40	OPEN
WGI Chairman	WGI 39.22	Action 39.22: WG-I Chairman to report to plenary (under agenda item I/1) to confirm CGMS Secretariat as coordinated representative of CGMS vis-à-vis SFCG for future meetings. Deadline: 7.Oct .2011	Closed on 7 October 2011.	07-Oct-11	CLOSED
EUMETSAT	WGI 39.23	Action 39.23: EUMETSAT (as CGMS Secretariat) to represent CGMS in the ad-hoc workshop proposed by WMO on of the future International Forum of Users of Satellite Data Telecommunication Systems (to ensure that there is at least one representative of CGMS). Deadline: CGMS-40.		CGMS-40	OPEN
NASA and NOAA	WGII 39.24	Action 39.24: NASA and NOAA to report on cal/val results from the NPP instruments, including comparisons of NPP sensors with EOS sensors and with airborne instruments. Deadline: CGMS-40		CGMS-40	OPEN
ASA	WGII 39.25	Action 39.25: NASA to discuss with GSICS the use of COVE tool to facilitate sensor calibration and validation activities. Deadline: CGMS-40.		CGMS-40	OPEN
NASA	WGII 39.26	Action 39.26: NASA to ask GPM-XCAL team to review and consider use of GSICS Product Acceptance Procedure. Deadline CGMS-40.		CGMS-40	OPEN
WMO Space Programme	WGII 39.27	Action 39.27: The WMO Space Programme to contact the South African Weather Service (SAWS) to inform them about the interest of NOAA and EUMETSAT to closely cooperate with SAWS on satellite product validation, especially for precipitation products. Deadline: CGMS-40.		CGMS-40	OPEN
CGMS Satellite Operators	WGII 39.28	Action 39.28: Satellite operators are requested to provide funding for participants of the 6th IPWG Workshop which will take place in Fortaleza, Brazil (tentatively 15-19 October 2012). Deadline: 30 June 2012.		30 June 2012	OPEN
All AMV Providers	WGII 39.29	Action 39.29: All AMV providers to make efforts to have the quality of their products tested by NWP centers. The slicing into specific AMV products (e.g. from WV or IR channels) and segregation into vertical levels is advised. Deadline: CGMS-40.		CGMS-40	OPEN
IWWG Co-Chairs and Rapporteurs	WGII 39.30	Action 39.30: The co-chairs of IWWG and the rapporteur are requested to discuss the results from NWP impact studies at IWW11, and to synthesize general observations on performance. Due date: IWW11 in February 2012 and report to CGMS-40.		Feb 2012 and report to CGMS-40	OPEN

CGMS-39 actions					
Actionee	**Action**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**
IWWG Co-Chairs and Rapporteurs	WGII 39.31	Action 39.31: IWWG co-chairs and the rapporteur are requested to report to CGMS 40 on the 2nd AMV intercomparison campaign. Deadline: CGMS-40.		CGMS-40	OPEN
CGMS Members	WGII 39.32	Action 39.32: CGMS agencies are encouraged to participate in the next International Radio Occultation Working Group (IROWG) Workshop to be held in Estes Park, Colorado 28 March - 3 April, 2012. Details can be found at www.irowg.org. Deadline 01 March 2012		01-Mar-12	OPEN
CGMS Members	WGII 39.33	Action 39.33: CGMS agencies are encouraged to report scientific progress on use of Radio-occultation, opportunities to provide increased coverage by RO sensors as well as to report on data gap issues to the IROWG, and directly to CGMS. Deadline: CGMS-40.		CGMS-40	OPEN
CSA and EC	WGII 39.34	Action 39.34: CSA and Environmental Canada to discuss volcanic ash detection and composition products from PCW, and plans to provide rapid transmission of volcanic eruption alerts to the Northern Hemisphere VAACs. Deadline: CGMS-40.		CGMS-40	OPEN
JMA	WGII 39.35	Action 39.35: JMA is invited to present an intercomparison of the new MTSAT SST product with other (similar) products. Deadline: CGMS-40.		CGMS-40	OPEN
Vlab co-chairs	WGII 39.36	Action 39.36: VLab co-chairs to address the potential of training support with the SWFDP responsible in WMO. Deadline: CGMS-40.		CGMS-40	OPEN
CGMS Satellite Operators	WGII 39.37	Action 39.37: CGMS Satellite Operators to consider the requirements of satellite information for coastal applications that are described in WMO-W-30, and provide comments to WMO (blee@wmo.int). Deadline: 31 Dec 2011		31-Dec-11	OPEN
CGMS Members	WGII 39.38	Action 39.38: CGMS members to liaise with WMO (blee@wmo.int) to coordinate training activities on forecasting and warning for storm surges and coastal inundation. Deadline: 31 December 2011		31-Dec-11	OPEN
NOAA	WGII 39.39	Action 39.39: NOAA to report to SCOPE-CM on the progress of extending SSMI precipitable water products with SSMIS. Deadline: Next SCOPE-CM meeting that will take place in August 2012 in Berlin. Deadline: 31 August 2012.		31-Aug-12	OPEN
Rapporteurs of International CGMS Science Working Groups	WGII 39.40	Action 39.40: GCOS Secretariat to clarify the request formulated in the GCOS/WCRP letter (dated 12 May 2010) and to ask for an adequate response as further spelled out in WMO-WP-23. Rapporteurs of the four CGMS Working Groups (IROWG, IPWG, ITWG and IWWG) are requested to put this on the agenda of the upcoming meetings of the four Working Groups and to report back to CGMS40 and the GCOS Secretariat. Deadline: CGMS-40.		CGMS-40	OPEN

CGMS-39 actions					
Actionee	**Action**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**
CGMS Rapporteurs	WGII 39.41	Action 39.41: CGMS requests the Rapporteurs to discuss, at the upcoming International Scientific Working Group meetings, the WG contributions to ECV production and reprocessing activities, and other relevant climate work. Deadline: CGMS-40.		CGMS-40	OPEN
NOAA	WGIV 39.42	Action 39.42: NOAA to provide more information on the content of LRD broadcasts in due course. Deadline: CGMS-40.		CGMS-40	OPEN
EUMETSAT and NOAA	WGIV 39.43	Action 39.43: EUMETSAT and NOAA to prepare a new global specification for LEO high rate broadcast services and present it for consideration at the next meeting of CGMS. Deadline: CGMS-40.		CGMS-40	OPEN
CMA	WGIV 39.44	Action 39.44: CMA to nominate a Point of Contact to follow the evolution of the new global specification for LEO high rate broadcast services and to comment accordingly at CGMS 40. Deadline: CGMS-40.		CGMS-40	OPEN
WMO	WGIV 39.45	Action 39.45: WMO to consult WMO Members on the requirement for a “Low Data Rate” service in L-Band on future generation polar-orbiting systems, and on the expected contents of such a service. Deadline: CGMS-40.		CGMS-40	OPEN
EUMETSAT	WGIV 39.46	Action 39.46: EUMETSAT to re-assess the European user requirement for a L-band service from its LEO satellites, bearing in mind the ongoing broader consultation process of WMO, and report to CGMS accordingly. Deadline: CGMS-40.		CGMS-40	OPEN
CGMS Secretariat	WGIV 39.47	Action 39.47: The CGMS Secretariat to prepare an amendment of the CGMS HRIT/LRIT Global Specification (CGMS 03) with effect to adopt the geographical reference system of the World GFeodetic System (WGS84) and Earth Geodetic Model (EGM-96) as described in CGMS-39 WMO-WP-25. Deadline: CGMS-40.		CGMS-40	OPEN
CMA	WGIV 39.48	Action 39.48: CMA to prepare a CMACast fact sheet, including the process for user registration, and to provide this to CGMS Members and to WMO for further distribution to potential users in the Asia-Pacific region. Deadline: 31 March 2012		31-Mar-12	OPEN
CGMS Members	WGIV 39.49	Action 39.49: CGMS Members to nominate Points of Contact who can assist WMO with the development of common guidelines for long term data preservation. Deadline for nominations 31 December 2011. WMO to prepare a report on the guidelines to be presented to CGMS 40. Deadline: CGMS 40.		CGMS-40	OPEN
CGMS Secretariat	WGIV 39.50	Action 39.50: The CGMS Secretariat to distribute to CGMS Members the Report on European Long-Term Data Preservation Guidelines, for information, once this has been finalised. Deadline: CGMS 40.		CGMS-40	OPEN

CGMS-39 actions					
Actionee	**Action**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**
CGMS Members	WGIV 39.51	Action 39.51: All CGMS Members to consider interoperability of climate data sets and data sharing in general and report on their efforts at the next meeting of CGMS. Deadline: CGMS 40.		CGMS-40	OPEN
EUMETSAT and NOAA	WGIV 39.52	Action 39.52: EUMETSAT and NOAA to report on their progress with the establishment of interoperable climate data sets. Deadline: CGMS 40.		CGMS-40	OPEN
WMO	WGIV 39.53	Action 39.53: WMO to further refine the web-based Product Access Guide for satellite products, within the WMO Space Programme website, in collaboration with CGMS satellite operators. Deadline: CGMS 40.		CGMS-40	OPEN
CGMS Members	WGIV 39.54	Action 39.54: All CGMS Members to report at the next CGMS meeting on their progress with the implementation of WIS. Deadline: CGMS-40.		CGMS-40	OPEN

CGMS-39 recommendations					
Actionee	**Recommendation**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**
CGMS Members	Recommendation 39.01	Recommendation 39.01: CGMS agencies are invited to assess the possibility of implementing an IR Sounding in early morning orbit.		CGMS-40	OPEN
CGMS Satellite Operators	Recommendation 39.02	Recommendation 39.02: CGMS Satellite Operators are invited to support the strategy for improving the use of satellite data in SWFDP regional subprojects.		CGMS-40	OPEN
CGMS Satellite Operators	Recommendation 39.03	Recommendation 39.03: Satellite operators are asked to strive to harmonise the spectral characteristics of future Visible and Infrared imager channels in order to enable seamless application of differential absorption methods to data acquired from different platforms.		CGMS-40	OPEN
CGMS Satellite Operators	Recommendation 39.04	Recommendation 39.04: CGMS Satellite operators are asked to ensure the earliest possible deployment of next generation geostationary platforms with enhanced multi-spectral VIS-IR capabilities.		CGMS-40	OPEN
CGMS Satellite Operators	Recommendation 39.05	Recommendation 39.05: CGMS Satellite operators are asked to consider the deployment of operational LIDAR sensors in Low Earth Orbit to provide multi-daily coverage over global air routes.		CGMS-40	OPEN
CGMS Members	Recommendation 39.06	Recommendation 39.06: CGMS members are invited to ensure, as appropriate, their involvement in the Polar Space Task Group in support of the WMO Global Cryosphere Watch (List of invitees to first meeting 13-14 October 2011 in Geneva, Switzerland:http://www.wmo.int/pages/prog/sat/meetings/documents/PSTG-1_Inf_02_%20Invitees.pdf)		CGMS-40	OPEN
CGMS Members	Recommendation 39.07	Recommendation 39.07: CGMS is invited to note the outcome of the 2011 WOAP workshop, in particular in the context of the development of an architecture for climate monitoring from space.		CGMS-40	OPEN
CGMS Members	Recommendation 39.08	Recommendation 39.08: CGMS Members are invited to include links to the VLab Calendar of Events and the ESRC.		CGMS-40	OPEN

CGMS-39 recommendations					
Actionee	**Recommendation**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**
CGMS Members	Recommendation 39.09 WGI	Recommendation 39.09: CGMS Members are encouraged to participate in the ad-hoc workshop and subsequent activities of the future International Forum of Users of Satellite Data Telecommunication Systems. This is adopted with the understanding that the Terms of Reference (ToR) of this forum are still draft and will be subject to consolidation by the participants in the group.		CGMS-40	OPEN
All AMV and CSR Product providers	Recommendation 39.10 WGII	Recommendation 39.10: All AMV and CSR product providers are invited to continue or start the regular reprocessing of those products with state-of-the-art algorithms.		CGMS-40	OPEN
CGMS Members	Recommendation 39.11 WGII	Recommendation 39.11: CGMS agencies are encouraged to provide instrument monitoring results at CGMS-40.		CGMS-40	OPEN
CGMS Satellite Operators	Recommendation 39.12 WGII	Recommendation 39.12: CGMS Satellite Operators to provide regular information on satellite/instruments events affecting calibration and establish corresponding websites.		CGMS-40	OPEN
CGMS Satellite Operators	Recommendation 39.13 WGII	Recommendation 39.13: CGMS Satellite Operators to provide Instrument Performance Monitoring information routinely on their respective websites.		CGMS-40	OPEN
CGMS Members	Recommendation 39.14 WGII	Recommendation 39.14: CGMS Members participating in GSICS to provide a representative in the GDWG.		CGMS-40	OPEN
CGMS Members	Recommendation 39.15 WGII	Recommendation 39.15: CGMS to support the development of guidelines by WMO for the design of future instruments with a view of harmonizing some spectral characteristics (e.g. central λ) of at least some core geostationary imager channels.		CGMS-40	OPEN
CGMS Members	Recommendation 39.16 WGII	Recommendation 39.16: CGMS Members that are not currently participating to consider an active role in the future progress of GSICS, enabling their sensors to be used for inter-calibration and to benefit from the experience collected in GSICS.		CGMS-40	OPEN
CGMS Members	Recommendation 39.17 WGII	Recommendation 39.17: CGMS agencies are encouraged to support scientists to attend the next ITWG.		CGMS-40	OPEN
The Snowfall community	Recommendation 39.18 WGII	Recommendation 39.18: The snowfall community is confident in the capabilities of Space-borne multi-frequency Doppler radar for global snowfall measurement and requests space research agencies to plan future missions that implement double-frequency capability as a minimum.		CGMS-40	OPEN
Space Agencies	Recommendation 39.19 WGII	Recommendation 39.19: Space agencies should continue to favour integrated science teams that encompass the measurement, modelling and data assimilation communities through proposals, campaigns and free dataflow.		CGMS-40	OPEN
CGMS Members	Recommendation 39.20 WGII	Recommendation 39.20: CGMS agencies are encouraged to follow NASA's example of comprehensive and sustaining science support for satellite missions, including comprehensive validation campaigns.		CGMS-40	OPEN
CGMS Members	Recommendation 39.21 WGII	Recommendation 39.21: CGMS members are invited to assist the funding of a training event which is planned to be held concurrently with IPWG-6.		CGMS-40	OPEN
AMV Providers	Recommendation 39.22 WGII	Recommendation 39.22: All AMV providers should make an effort to have the quality of their products tested by NWP centers. It is recommended to present such results already at the 11th International Winds Workshop in February 2012.		31-Jan-12	OPEN

CGMS-39 recommendations					
Actionee	**Recommendation**	**Description**	**Action feedback/closing document**	**Deadline**	**Status**
IWWG	Recommendation 39.23 WGII	Recommendation 39.23: CGMS-39 advised IWWG 11 to further address the salient issues and topics listed in EUM-WP-27.		CGMS-40	OPEN
CGMS Members	Recommendation 39.24 WGII	Recommendation 39.24: CGMS agencies are encouraged to support scientists to attend the next IWWG meeting.		CGMS-40	OPEN
CGMS Members	Recommendation 39.25 WGII	Recommendation 39.25: CGMS Agencies are invited to :i) further test the performance of the NWCSAF AMV software package by testing the products in a NWP data monitoring/ assimilation system, and ii) extend the current software to clear-sky WV AMVs.		CGMS-40	OPEN
AMV Providers	Recommendation 39.26 WGII	Recommendation 39.26: Satellite AMV providers are invited to examine the stand-alone AMV software package from the NWCSAF and to report back to CGMS 40.		CGMS-40	OPEN
EUMETSAT NWC SAF	Recommendation 39.27 WGII	Recommendation 39.27: EUMETSAT NWC SAF to consider providing a tested option to allow running of alternative algorithms to support algorithm intercomparisons studies.		CGMS-40	OPEN
NOAA/CIMSS	Recommendation 39.28 WGII	Recommendation 39.28: NOAA/CIMSS to report on additional case study results using NearCasting, and, if practical, to include collaboration with the Severe Weather Forecasting Demonstration Project (SWFDP) for the Lake Victoria region. Deadline CGMS-40.		CGMS-40	OPEN
CGMS Satellite Operators	Recommendation 39.29 WGII	Recommendation 39.29: CGMS Satellite Operators are invited to advise on satellite products that could be made available in response to the needs of the SWFDP – Eastern Africa, to facilitate the timely provision of such satellite-related information, and to consider the SWFDP needs for the Lake Victoria Basin region in future product development activities.		CGMS-40	OPEN
CGMS Members	Recommendation 39.30 WGII	Recommendation 39.30: CGMS Members are encouraged to identify opportunities to develop and improve products and services contributing to CIFDP.		CGMS-40	OPEN
CGMS Members	Recommendation 39.31 WGIII	Recommendation 39.31: WGIII recommended that the baseline be submitted to and endorsed by the plenary with the amendments and clarifications brought by the session, as included in Annex 1 to the WG-III report.	(Baseline was endorsed by CHMS-39 plenary).	CGMS-40	CLOSED
CGMS Members	Recommendation 39.32 WGIII	Recommendation 39.32: R & D or operational satellite operators should consider the provision of some high-accuracy and stable reference instruments as anchors for operational instruments, in particular, for climate purposes.		CGMS-40	OPEN
CGMS Members	Recommendation 39.33 WGIII	Recommendation 39.33:CGMS Satellite Operators to address the anticipated or potential gaps identified in the WMO Gap Analysis, in particular: • infrared and microwave sounding on the early morning orbit, • hyperspectral sounding missing in some geostationary sectors, • long-term follow-on of radio-occultation constellation, • global precipitation measurement precipitation radar follow-on mission, • long-term Earth Radiation Budget monitoring, • limb sounding for high-vertical resolution observations in the stratosphere and mesophere (of temperature, humidity, wind, aerosol, ozone, and other trace gases).		CGMS-40	OPEN
CGMS Members	Recommendation 39.34 WGIV	Recommendation 39.34: CGMS satellite operators to adopt the World Geodetic System (WGS84) and Earth Geodetic Model (EGM-96) geographical reference systems for the normalised geostationary projections in all future geostationary systems and related products, and inform the users accordingly.		CGMS-40	OPEN

I.5 DATE AND PLACE OF THE NEXT MEETINGS

The next 5 meetings might rotate as follows:

- 2012: WMO
- 2013: JMA (TBC)
- 2014: CMA
- 2015: NOAA/NASA
- 2016: EUMETSAT

CGMS was pleased to accept an offer from WMO and MeteoSwiss to host CGMS-40 in Switzerland next year, 5-9 November 2012. This will be confirmed as soon as possible by WMO and the CGMS Secretariat.

The Chairperson thanked all participants for their cooperation and fruitful participation in CGMS-39, adding there had been many interesting discussions and important developments during the Working Groups and Plenary session.

The meeting adjourned at 13:00 on 7 October 2011.

CGMS-39 agreed that the final draft report would be distributed for last minute updates via email in the next 2-week period.

PARALLEL WORKING GROUP SESSIONS

WORKING GROUP I: TELECOMMUNICATIONS

I/0 Introduction

As agreed at the beginning of the plenary session of CGMS-39, Mr Marlin O. Perkins (NOAA) and Mr. Joaquin Gonzalez (EUMETSAT) were elected as Chairperson and Rapporteur, respectively, of Working Group I (WG I) on Telecommunications. WG I comprised representatives of the satellite operators from CMA, JMA, KMA, NOAA, IMD, ROSHYDROMET, ROSCOSMOS and EUMETSAT together with WMO (see Annex 4 for full list of participants).

The Agenda proposed by the CGMS Secretariat prior to the meeting, was adopted with the following modifications:

- **NOAA-WP-16** moved from G.I/1 to G.I/2;
- **EUM-WP-33** moved from G.I/2 to G.I/1;
- **CMA-WP-07** moved from G.I/7 to G.I/2;
- **NOAA-WP-17** moved from G.I/4 to G.I/3.2.

I/1 Review of actions from the Previous Meeting

Actions from previous meetings are reported in **EUM-WP-33**. In addition, NOAA reported on its response to Action 37.23 (see below).

Action 37.23: All CGMS members to report on their plans of utilization for the band 7750-7850/7900 MHz (i.e. including the 7850-7900 MHz extension if agreed in WRC-11). **Deadline: CGMS-38**.

Status closed: answered in NOAA-WP-15

In response to CGMS action 37.23, information on NOAA current and future missions planning to use the frequency band 7750 - 7850/7900 MHz is provided. The band 7750 – 7850 MHz is currently planned for use by the by the NOAA/NASA NPOESS Preparatory Project (NPP) and the NOAA Joint Polar-orbiting Satellite System (JPSS) for the downlink of raw instrument data to satellite direct readout users at 7830MHz with a data rate of 20 Mbps and a bandwidth of 30.8 MHz.

The action is considered closed for NOAA and a new action was raised during CGMS-39 WG-I meeting to cover the issue with follow on actions to analyse potential interference impacts at agency level with the information provided by other CGMS members.

Action 39.20: CGMS Members to report on their plans **for the utilisation of the band 7750-7850/7900 MHz for their existing and future LEO systems (including the detailed list of frequencies used in the band, associated bandwidth and signal characteristics - together with the orbital parameters). Deadline: 31.12.2011**

Action 39.21: Based on the inputs of the previous action, CGMS members to analyse potential interference issues, reporting results of analysis back to CGMS WG-I by next CGMS meeting. Deadline: CGMS-40

Action 38.15: CGMS Members to provide to each CGMS meeting a list of frequencies used by their current and future systems in the format provided in WG I report (Annex 1) (merged version of WMO frequency reports amended with the extra fields as provided in Tables 1 and 2 of Document CGMS-38 **EUM-WP-23**). **Deadline: CGMS-38.**

Status: Closed. This is considered to be a "permanent" action (P 10) in WG-I and aims to have corresponding WPs provided by CGMS members for every CGMS meeting.

Response: CMA-WP-07, **JMA-WP-02** (current), **JMA-WP-03** (follow-on), **NOAA-WP-14** and **EUM-WP-21**

Action 38.16: CGMS members to provide to the CGMS Secretariat and IMD their operational and planned use of the data collection service (regional and international) that contains or overlap the band 402.25-402.65 in a format as provided in Annex 1 of this WG I report. **Deadline:** 15 December 2010 at the latest.

Status: Closed. Answered. Inputs provided by JMA (15/12/2010), NOAA (15/12/2010) and EUMETSAT (at CGMS 38 meeting). Reminder sent by CGMS Secretariat to all CGMS members on 14/01/2011. No additional replies provided.

To be noted that the original input provided by the CGMS Secretariat in **WP-EUM-33** did not include (by mistake) any reference to the answer to the action provided by JMA on 15/12/2010. WP-33 will be amended after the WG-I meeting to remove this gap.

Propose to formally close this action at CGMS-39 meeting.

Action 38.17: Concerning US public enquire for sharing with 4G mobile systems of the 1675-1710 MHz band CGMS members are encouraged to provide CGMS secretariat their inputs and position regarding the impact on their current and future systems (or a more general copy of the letters submitted in response of the US public enquire). **Deadline:** 1 December 2010.

Status: Closed. See CGMS Secretariat mail on 26 January 2011.

Action 38.18: CGMS Secretariat to draft a letter to the appropriate US officials to address the concern of the WMO and CGMS members and the implications on their systems and services based on the shared use of this band by 4G mobile systems. **Deadline:** 15 December 2010.

Status: Closed. See CGMS Secretariat mail on 05 January 2011.

I/2 Coordination of Frequency Allocations: SFCG, ITU and WRC Activities

In preparation for the World Radiocommunication Conference to be held in January-February 2012 (WRC-12), thirteen key agenda items from WRC-12 are identified, along with their current status. A number of issues of interest and concern to CGMS in relation to the Meteorological Satellite Service (MetSat) and Earth Exploration-Satellite Service (EESS) as defined in the RR of the ITU are discussed in **EUM-WP-22**, **WMO-WP-19** and **NOAA-WP-16**. Those WRC-12 agenda items of relevance for CGMS are:

agenda item 1.2 :	Enhancing the international regulatory framework
agenda item 1.5 :	Electronic News Gathering (ENG)
agenda item 1.6 (Res. 950) :	Passive service between 275 and 3000 GHz
agenda item 1.8 :	Fixed service between 71 and 238 GHz
agenda item 1.15 :	Oceanographic radars in the frequency range 3-50 MHz
agenda item 1.16 :	Lightning detection below 20 kHz
agenda item 1.19 :	Software Defined Radio (SDR) and Cognitive Radio Systems (CRS)
agenda item 1.20 :	High Altitude Platform Stations (HAPS) in the range 5 850-7 075 MHz
agenda item 1.22 :	Effect of emissions from short-range devices (SRD)
agenda item 1.24 :	Extension of the 7 750-7 850 MHz Metsat band to the band 7 850-7 900 MHz
agenda item 1.25 :	Mobile Satellite Service
agenda item 8.1.1: (issue C)	Resolution 673 (WRC-07) on Radiocommunicationsuse for Earth observation applications
agenda item 8.2 :	WRC-2015 Agenda

1.2 Agenda item 1.2: Enhancing the international regulatory framework

The CPM Report contains 5 Methods (A1-A5) related to conversion between terrestrial services and 2 Methods (B1-B2) related to general allocation issues. It is very difficult to evaluate the implications of Methods except A1 and B1 (no change to Radio Regulations (RR) under WRC-12 AI 1.2). For example: elimination of clear distinction between fixed service and mobile service could create incompatibility in frequency bands used by meteorological applications.

WMO supports no change to RR Methods (A1 and B1 as described in the CPM Report).

1.3 Agenda item 1.5: Electronic News Gathering (ENG)

The CPM Report contains 4 Methods (A, B, C, D). All propose “no change” to RR. Only Methods B and D require the development of a WRC Recommendation (B, D)/Resolution (D) on tuning ranges. The list of tuning ranges in a Working Documents towards a “Preliminary Draft New Report ITU-R F.[ENGTUNING RANGES] in accordance with Method C contains bands critical for meteorological applications (2 200-2 290, 2 700-2 900 MHz, 10.6-10.68 GHz, etc.).

WMO’s objective is to avoid increasing the interference level to meteorological applications due to the introduction of ENG tuning ranges. The WMO supports Method B in the CPM Report (“no change” to RR +

WRC Resolution/Recommendation on ENG tuning ranges) and opposes to inclusion in the tuning ranges bands 2 700-2 900, 5 470-5 725 MHz.

1.4 Agenda item 1.6 Res. 950: Passive service between 275 and 3000 GHz

The CPM Report contains only 1 Method: include into RR No. 5.565, bands of interest to Earth-exploration-satellite and space research passive services in the range 275-1 000 GHz and stress the interest of the passive services in the range 1 000-3 000 GHz. ITU-R recently approved Report ITU-R RS.2194 "Passive bands of scientific interest to EESS/SRS from 275 to 3 000 GHz" that provides the relevant frequency bands and technical background.

EUMETSAT supported the proposed revision of RR No. 5.565 as outlined in the CPM Text to include all appropriate frequency bands within the range 275 to 3000 GHz to be used by systems belonging to the Earth exploration-satellite (passive), including those planned in the framework of EPS Second Generation (EPS-SG) in order to protect these bands for scientific applications now and in the future.

In this context it should be noted that the listing of frequency bands above 275 GHz for passive sensing are not to be considered as frequency allocations, they are currently and continued to be just an identification of spectrum use. Since there is a lack of knowledge of the spectrum requirements for active users of the spectrum, frequency bands above 275 GHz will not be allocated to different radiocommunication services (including passive services) until an appropriate time in future.

WMO supports the only Method in the CPM Report.

1.5 Agenda item 1.8: Fixed service between 71 and 238 GHz

Current situation – Resolution 731 (WRC-2000) part: CPM Report contains 2 Methods (A1, A2) related to studies of sharing and adjacent band compatibility issues between passive and active services:

- Method A1 proposes to keep Resolution 731(WRC-2000), 732(WRC-2000);
- Method A2 suppresses these Resolutions.

There seems to be strong support for method A2 which could lead to increased vulnerability of passive sensor-based systems, which will no longer be protected by the resolution.

WMO position: taking into account that Resolution 731 (WRC-2000) covers sharing and adjacent band compatibility issues between passive and active services in general not only with the fixed service WMO should support the Method A1 in the CPM Report.

The CPM Report contains 2 Methods (B1, B2) related to modification of RR to protect systems of the Earth exploration-satellite service in the 86-92 GHz band by introducing limitations on unwanted emissions from systems in the fixed service through footnotes in the adjacent bands (81-86 and 92-95 GHz):

- Method B1 proposes to add a footnote to RR Article 5 containing unwanted emission power limits;
- Method B2 contains a sample of the footnote that "encourages administrations" to comply with the limits specified by the mask.

WMO position: in order to provide an adequate protection to EESS WMO supports the Method B1 in the CPM Report.

1.6 Agenda item 1.15: Oceanographic radars in the frequency range 3-50 MHz

The CPM Report contains 3 Methods (A, B, C) proposing the same set primary/secondary allocations (some, or portions of the frequency bands 3 155-3 200 kHz, 4 438-4 650 kHz, 5 060-5 450 kHz, 7 450-8 100 kHz, 9 040-9 400 kHz, 9 900-9 995 kHz, 12 100-12 230 kHz, 13 410-13 570 kHz, 13 870-14 000 kHz, 14 350-14 990 kHz, 15 800-16 350 kHz, 22 855-23 200 kHz, 24 000-24 890 kHz, 25 010-25 070 kHz, 25 210-25 550 kHz, 26 175-27 500 kHz, 39-39.986 MHz, 40.02-40.98MHz and 41.015-47 MHz) to oceanographic radars:

- Method A – primary allocations subject to Resolution 612 (Rev.WRC-12), referred in a new footnote in RR Article 5;
- Method B – secondary allocations, suppress Resolution 612 (WRC-07);
- Method C – primary and/or secondary allocations subject to Resolution 612 (Rev.WRC-12), referred in a new footnote in RR Article 5.

ITU-R approved new Recommendation ITU-R M.1874 "Technical and operational characteristics of oceanographic radars operating in sub-bands within the frequency range 3-50 MHz".

WMO position: from WMO prospective Method A provides the best opportunities for oceanographic radar applications.

1.7 Agenda item 1.16: Lightning detection below 20 kHz

Current situation: The CPM Report contains only

one Method proposing new allocation 8.3-11.3 kHz, modification of RR No. 5.53 and 5.54, addition of 2 new footnotes (one of them is an additional allocation for one administration) to RR Article 5. ITU-R approved new Recommendation ITU-R RS.1881 "Protection criteria for arrival time difference receivers operating in the meteorological aids service in the frequency band 9-11.3 kHz" and several ITU-R Reports (RS.2184, RS.2185, RS.2186).

WMO supports the proposed method that is ensuring long-term availability of lightning detection applications.

1.8 Agenda item 1.19: Software Defined Radio (SDR) and Cognitive Radio Systems (CRS)

Current situation: the CPM Report considers 2 issues: Issue A related to Software defined radio (SDR); Issue B related to cognitive radio systems (CRS).

- Issue A – one Method (A) in the CPM Report – no change to RR and suppress
- Resolution 956 (WRC-07);
- Issue B – two methods in the Report: B1 with options A, B and B2:
  - » Method B1 option A – no change to RR, suppress Resolution 956 (WRC-07);
  - » Method B1 option B – no change to RR, suppress Resolution 956 (WRC-07) + new WRC-12 Resolution on technical/operational studies for implementation of CRS;
  - » Method B2 – no change to RR, suppress Resolution 956 (WRC-07) + new WRC-12 Resolution on studies on deployment and use of CRS.

WMO position: CRS are incompatible with passive sensors. CRS shall not be used in "passive bands". WMO is concerned about the CRS use in the bands used by meteorological radars. WMO supports Methods A, B1 or B2. However the above-mentioned conditions should be observed.

1.9 Agenda item 1.20: High Altitude Platform Stations (HAPS) in the range 5 850-7 075 MHz

The CPM Report describes 2 Methods (A and B):

- Method A proposes NOC to RR, SUP Resolution 734 (Rev.WRC-07) and application of Resolution 122 (Rev.WRC-07). No additional spectrum identification for HAPS in the range 5 850-7 075 MHz;
- Method B: add a new Article 5 footnote identifying bands 6 440-6 520 (HAPS-to-ground), 6 560-6 6400 (ground-to-HAPS) MHz+ a new WRC-12 Resolution on the use of these bands by HAPS; suppress Resolution 734 (Rev.WRC-07), modify RR Article 11 and Appendix 4.

WMO position: the 6 425-7 075 MHz band is used by EESS (passive). ITU-R sharing studies show that HAPS will cause interference to EESS (passive) systems. Therefore WMO supports Method A (NOC to RR).

1.10 Agenda item 1.22: Effect of emissions from short-range devices (SRD)

The CPM Report contains 4 Methods (A, B, C, D):

- Method A – NOC to RR, national/regional regulations + ITU-R Recommendations/Reports;
- Method B – NOC to RR, a new WRC-12 Resolution inviting to study regional/global harmonization, technical requirements for SRD and develop ITU-R Recommendations/Reports;
- Method C – recognise a limited number of harmonized frequency bands and technical characteristics of SRD in WRC-12 Resolution or RR Article 5 (including limits on the aggregated use of SRD applications);
- Method D – include SRD definition and provisions for SRD operation in RR

ITU-R is currently approving Recommendation ITU-R SM.[SRD] "Frequency ranges for global or regional harmonisation of short-range devices (SRDs)". Accepting WMO position WP 1B removed frequency ranges 401-406, 5 150-5 350, 5 470-5 725 MHz from the list of harmonized SRD bands.

WMO position: any method under condition that ranges 401-406, 5 150-5 350, 5 470-5 725 MHz not identified for SRD applications.

1.11 Agenda item 1.24: Extension of the 7 750-7 850 MHz Metsat band to the band 7 850-7 900 MHz

The CPM Report contains one Method only. The method proposes to modify RR:

- add a global primary MetSat allocation (space-to-Earth) in the band 7 850-7 900 MHz limited to non-geostationary meteorological satellites;
- apply power-flux density limits contained in RR Article 21 - same as applied for meteorological satellites in the band 7 250-7 850 MHz, use the same coordination distances as for the band 7 250-7 850 MHz (RR Appendix 7); · suppress Resolution 672 (WRC-07).

WMO position: WMO is completely in line with the Method in the CPM Report.

1.12 Agenda item 1.25: Mobile Satellite Service

Currently, six (6) frequency bands that considered as potential new MSS allocations and related Methodsare shown in CPM Report. According to RR No. 5.458 in the band 7 055-7 250 MHz, passive measurements are carried out over ocean. The band 13.25-13.4 GHz is allocated to EESS (active) MSSEESS sharing studies have been just recently completed and it was shown that it was possible to share this band with MSS under the conditions currently (15 September 2011) specified in the preliminary Draft Report ITU M.[MSS-SHARING]. The band 10.6 - 10.68 is allocated to EESS (passive) and MSS in the adjacent 10.5-10.6 GHz band may create unacceptable out of band emissions. MSS allocations in the above-mentioned bands may create significant problems for meteorological applications.

WMO supports:

- allocation to MSS in the frequency band 7 055-7 250 MHz (Method B1);
- WMO may agree to allocations in the 10.5-10.6 GHz (Method D2) and 13.25-13.4 GHz bands (Method E2) if protection of the adjacent frequency range 10.6-10.7 GHz is ensured and if protection as currently (15 September 2011) specified in the preliminary Draft Report ITU M.[MSS-SHARING] is also ensured.

1.13 Agenda item 8.1.1: (issue C) Resolution 673 (WRC-07) on Radiocommunications use for Earth observation applications

In response to Resolution 673 (WRC-07) ITU-R with active participation of WMO developed several deliverables such as Recommendation ITU-R RS.1883 “Use of remote sensing systems in the study of climate change and the effects thereof”, Report ITU-R RS.2178 “The essential role and global importance of radio spectrum use for Earth observations and for related applications”, ITU/WMO Handbook “Use of Radio Spectrum for Meteorology: Weather, Water and Climate Monitoring and Prediction”. CPM Report proposes: add to a new provision to RR Article 4:4.YZ Member States recognise the importance of the Earth observation related radio services; in this respect it is necessary to take into account Resolution 673 (Rev. WRC-12).revise Resolution 673 (WRC-07) taking into account the current development.

WMO supports all actions aimed at further recognition of the essential role and global importance of meteorological applications and related radio systems/ networks. WMO considering that the results of ITU/ WMO common studies (to be included in the BR Director’s Report to WRC-12) are adequate response to Resolution 673 (WRC-07).

1.14 Agenda item 8.2: WRC-2015 Agenda

Two items already identified by WRC-07:

- Spectrum requirements and possible new allocations in the RDS to support operation of unmanned aerial systems (UAS);
- Review use of band 5091-5150 MHz for feeder links of NGSO MSS in accordance with Resolution 114 (Rev.WRC-03).

There is no official information on proposed WRC-15 Agenda Items.

NOAA’s input to SFCG-31 was an updated list of present and future radio frequency requirements of NOAA satellite networks.

NOAA reported on the activities of the International Telecommunication Union – Radiocommunication (ITU-R) sector Working Parties 7B and 7C (WP7B, WP7C) and Study Group 7 (SG7).

Working Party 7B, Space Radio communication Applications, met from 5-11 October 2010 in Geneva. Three working groups met during this time. NOAA provided a summary from each of the working group’s activity:

1. Working Group 1
   a. Review of SA Series Recommendations
   b. Addressed Recommendations to be suppressed
   c. Reviewed Recommendations recently approved or updated that need no further action at this time
   d. Reviewed Recommendations that need to be updated
   e. Reviewed Recommendations that do not need to be updated
   f. Review of Questions Assigned to WG 7B-1

2. Working Group 2
   a. **WRC-12 Agenda item 1.12: Sharing in the 37-38 GHz band**
      The draft new Report), which contains the results of sharing studies between the AMS and the SRS in the band 37-38 GHz. WP 7B agreed to submit this document to the second day of SG 7 meeting for approval, was subsequently adopted by SG 7 as Report ITU-RSA.2190 (see Document 7/123).
   b. **WRC-12 Agenda item 1.25: Possible additional allocations to the MSS in 4-16 GHz**
      WP 7B agreed to send a liaison statement to WP 3M requesting confirmation on the applicability of Recommendation ITU-R P.452 in the resolution of WRC-12 Agenda item 1.25. A copy of this liaison statement was also sent to WP 4C.

c. **Sharing in the band 37.5-38 GHz**
The working document towards a preliminary draft new Report ITU-R SA.[SRS SHARING 37 GHz] on the sharing between FSS and SRS in the band 37.5-38 GHz was agreed by WP 7B to be attached as an annex to the Chairman's Report for further consideration at the next WP 7B meeting. WP 7B also agreed to a drafted liaison statement to WP 4A requesting comments and informing them that WP 7B plans to use these results to develop a sharing recommendation between FSS and SRS.

d. **WRC-12 Agenda item 8.1.1 issue**
Following a request from WP 1A to provide relevant WP 7B Protection criteria so that these criteria can be sent to the International Special Committee on Radio Interference (CISPR) for inclusion in the TR CISPR 31 database, WP 7B approved a liaison statement containing a list of all Recommendations dealing with protection criteria.

e. Review of questions

f. Review of Recommendations

3. Working Party 7C – Remote Sensing Systems.
Working Party 7C "Remote sensing systems" met in Geneva from 5 to 8 October 2010. NOAA presented a summary of the output documents from this meeting. Output documents from the Group included:

- Three Draft new ITU-R Recommendations (DNR);
- Two Preliminary draft revised Recommendations (PDRR) PDRR's were reviewed at this meeting;
- Recommendations proposed for suppression (one);
- A draft new Report was sent to SG 7 for adoption.

4. Study Group 7 – Science Services

As the overseeing body for its working parties, SG7 is responsible for reviewing the outputs of the working parties. If an output is approved by SG7, it is sent forward to the members of the ITU for adoption.

WG-I thanked the WMO for its continued support in monitoring frequency management issues and bringing them to the attention of CGMS. Their continued support has enabled CGMS satellite members to operate MetSats and Metaids effectively and efficiently throughout the years. Thanks to their determination and perseverance, meteorological aids can operate in a positive environment.

WG-I also acknowledged the actions and support of NOAA and EUMETSAT to inform CGMS on frequency issues that affect the operation of MetSats and Metaids. The work done by both Organisations is a valuable constituent enabling CGMS to coordinate steps needed to make critical decisions in maintaining the operations of meteorological systems.

NOAA, EUMETSAT and the WMO are valuable assets to CGMS in making sure satellite operators are informed of frequency matters affecting their systems. WG-I truly appreciates their support and encourages CGMS members to advocate the proposed position in preparation for WRC-12 with their relevant frequency authorities.

The different working papers (**EUM-WP-22**, **WMO-WP-19** and **NOAA-WP-16**) have also reported on the SFCG yearly meeting outcome and EUMETSAT, following the report provided in **EUM-WP-22**, has proposed that the CGMS Secretariat should have a permanent action to report to CGMS WG-I on the discussions held at SFCG level. This was unanimously agreed within WG-I but it felt it necessary to bring it to the plenary meeting to seek confirmation under agenda item I.1 (Nomination of CGMS representatives at other meetings).

Action 39.22: WG-I Chairman to report to plenary (under agenda item I/1) to confirm CGMS Secretariat as coordinated representative of CGMS vis-à-vis SFCG for future meetings. Deadline: 7.10.2011.

Permanent Action 09: EUMETSAT (as CGMS Secretariat) to provide a yearly report to WG-I on the annual SFCG meeting. Deadline: CGMS 40.

I/3. Telecommunications Techniques

WMO-WP-25 proposed an amendment to the CGMS HRIT/LRIT Global Specification (CGMS 03) with effect to align the geographical reference system of the normalized geostationary projection with the internationally agreed standards World Geodetic System 1984 (WGS84) and Earth Geodetic Model (EGM-96) as recommended by the WMO Commission for Basic Systems.

It is emphasized that the current discrepancy between the HRIT/LRIT Global Specification and these international standards is a potential source of confusion and generates a risk of positioning errors when merging data with e.g. GPS-based sources, or Geographic Information System (GIS) applications, or when exchanging data with these communities.

The space agency representatives participating in the sixth meeting of the Expert Team on Satellite Systems (ET-SAT-6) thus unanimously agreed that CGMS should be requested to update its HRIT/LRIT Global Specification. The amendment would affect three parameters in Section 4.4.3.1 (Geographical coordinates) and Section 4.4.3.2 (Normalised geostationary projection): the reference meridian, the

equator radius and the polar radius, as well as four numerical coefficients derived from these parameters.

During the discussion of the WP, it was noted that the **WMO-WP-25** would be presented to both WG-I and WG-IV since the CGMS HRIT/LRIT Global Specification had been originally drafted by WG-I but might be better suited to the current expertise of WG-IV . Discussions within WG-I confirmed that Global Specifications do actually cover both telecommunications aspects and data formats so it is appropriate that the WP be submitted to both working groups to make sure that the proposed modifications are considered at all levels. In the specific case of the modifications proposed in **WMO-WP-25**, WG-I agreed that it was only affecting data formatting (presentation layer) and WG-I therefore deferred the proposal to WG-IV.

I/3.1 Coordination of International Data Collection & Distribution

No Working Papers were presented

I/3.2 Status and Problems of IDCS

NOAA-WP-17 provided a status report on the performance of the International Data Collection System (IDCS) and NOAA's domestic DCS. NOAA's DCS Automated Processing System (DAPS) was replaced by the new DCS Administrative and Data Distribution System (DADDS) in October 2009. This year's focus has been on populating user and platform tables, and registering and training the community to use the system. NOAA has finalised new Certification Standards to allow transmitters to use smaller channels, has certified 3 manufacturers to this standard and has configured our receive systems to allow those transmitters to operate. The transition to high data rate (HDR) continues, with more than 20,000 of the 22,774 platforms that are active reporting at 300 or 1200 bit/sec. NOAA plans to continue to investigate the use of two way communications to better command and control platforms but has made little progress this year due to conflicting priorities. NOAA is proceeding slowly with this project, since most resources are being committed to DADDS and to the Version 2 HDR transmitter implementation. Use of the international channels is minimal. NOAA has begun fully using the channels assigned to us for our domestic use by CGMS. An initial problem was encountered because many manufacturers built transmitters that could only operate in the international format in channels above number 200, but those have been resolved by reprogramming of the transmitters by their developers.

ROS-WP-06 provided a summary of the current status and technical specifications of Russian DCS (Electro-L#1) are described. During Electro-L#1 flight tests and commissioning phase DCS proved to be fully functional.

After the presentation of the **ROS-WP-06** working paper and in the round of questions from the different WG-I participants, NOAA asked about the ROSHYROMET plans for transitioning from the 100 bps to 1200 bps. ROSHYROMET has confirmed that no transitioning plans are considered and that both systems (100 and 1200 bps) will co-exist during the next years.

WG-I takes the opportunity of the CGMS-39 meeting to congratulate ROSHYROMET on the successful launch of their Electro-L#1 on 20 January2011 and the ongoing commissioning phase reported to be about to finish.

I/3.3 Ships, including ASAP

No Working Papers were presented

I/4 Dissemination of DCP messages (GT or other means)

No Working Papers were presented

I/5 Future Use of IDCS

WMO-WP-28 referred to a particular outcome of the Sixteenth World Meteorological Congress (Cg-XVI, Geneva, Switzerland, 16 May – 3 June 2011) which agreed an initiative towards establishing an International Forum of Users of Satellite Data Telecommunication Systems together with IOC and FAO partner international organisations. The Management Group of the Commission for Basic Systems (CBS) has proposed draft Terms of Reference and a workplan leading in principle to the formal adoption of such a forum in 2013.

The CGMS was invited to take note of this proposal, make recommendations as appropriate regarding the proposed workplan, consider nominating a representative in the organising committee, and participate in an ad hoc workshop and in the forum once established. It was clarified that the topics to be addressed by this proposed forum would include but not be limited to the use of Data Collection Systems (DCS), with a view to compare available technologies, help identify the most suitable ones and negotiate accordingly the best conditions with the telecommunications service providers.

The paper was discussed during WG-I meeting and the following recommendation is agreed:

Recommendation 39.09: CGMS Members are encouraged to participate in the ad-hoc workshop and subsequent activities of the future International Forum of Users of Satellite Data Telecommunication Systems.

This is adopted with the understanding that the Terms of Reference (ToR) of this forum are still draft and will be subject to consolidation by the participants in the group.

In order to secure the implementation of the recommendation, WG-I proposed that CGMS Secretariat, at least, should participate in the preparatory activities of the ad-hoc workshop and agreed the following action:

Action 39.23: EUMETSAT (as CGMS Secretariat) to represent CGMS in the ad-hoc workshop proposed by WMO on of the future International Forum of Users of Satellite Data Telecommunication Systems (to ensure that there is at least one representative of CGMS). Deadline: CGMS-40.

I/6 Search and Rescue (S&R)

No Working Papers were presented

I/7 Review of Actions, Conclusion and Preparation

Status of actions from previous meetings. All non permanent actions assigned to WG-I in previous meetings are closed at Working Group I level.

Action 38.15 (permanent). CGMS Members to provide at every CGMS meeting a list of frequencies used by their current and future systems in the format provided in WG I report-39 (Annex 1). **Deadline: CGMS-40**

Is now:

Permanent Action 10: CGMS Members to provide at every CGMS meeting a list of frequencies used by their current and future systems in the format provided in WG I report-39 (Annex 1).

Action 39.20: CGMS Members to report on their plans for the utilisation of the band 7750-7850/7900 MHz for their existing and future LEO systems (including the detailed list of frequencies used in the band, associated bandwidth and signal characteristics - together with the orbital parameters). Deadline: 31.12.2011

Action 39.21: Based on the inputs of the previous action, CGMS members to analyse potential interference issues, reporting results of analysis back to CGMS WG-I by next CGMS meeting. Deadline: CGMS-40

Action 39.22: WG-I Chairman to report to plenary (under agenda item I/1) to confirm CGMS Secretariat as coordinated representative of CGMS vis-à-vis SFCG for future meetings. Deadline: 7.10.2011.

Permanent Action 09: EUMETSAT (as CGMS Secretariat) to provide a yearly report to WG-I on the annual SFCG meeting. Deadline: CGMS 40.

Action 39.23: EUMETSAT (as CGMS Secretariat) to represent CGMS in the ad-hoc workshop proposed by WMO on of the future International Forum of Users of Satellite Data Telecommunication Systems (to ensure that there is at least one representative of CGMS). Deadline: CGMS-40.

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This is adopted with the understanding that the Terms of Reference (ToR) of this forum are still draft and will be subject to consolidation by the participants in the group.

WORKING GROUP II: SATELLITE PRODUCTS

G.II/0 Introduction

The Working Group II on Satellite Products was chaired jointly by Prof. Vasily Asmus, from ROSHYDROMET, and Dr. Vaddi Rao, from IMD, Dr. Mitch Goldberg, NOAA, and Dr. Johannes Schmetz, EUMETSAT, assisted as rapporteurs with help of Dr. Volker Gärtner and Dr. Stephan Bojinski. More than 50 working papers were presented and discussed by the 27 participants (see full list of participants in Annex 4). The discussions did benefit from a new format of the presentations of the papers which were all projected with a beamer while being presented.

As opening to this session of WG II at CGMS 39 ROSHYDROMET /SRC Planeta presented a very nice and comprehensive overview paper entitled 'Applications of Meteorological Satellite Data for Environment Monitoring and Climate Research in ROSHYDROMET'. The paper summarised the ground segment developed for the acquisition, processing and distribution of satellite data and products. It was recalled that the objective of operational and research activities in ROSHYDROMET is to use satellite data and derived products in various application areas, including operational meteorology, NWP, hydrology, agrometeorology, hazards (fires, floods) and pollutions monitoring, and climate research. Examples of some derived by SRC Planeta products were presented.

Cloud imagery and cloud cover parameters continue to be one of the key products of both polar orbiting and geostationary meteorological satellites. Examples of full Earth disk images were shown as acquired by the MSU-GS/Electro-L instrument in VIS (1 km spatial resolution) and IR (10.5-11.2 μm, 4 km spatial resolution). The measurements of microwave scanning radiometers like the sounder/imager MTVZA/ Meteor-M and the sounder AMSU (NOAA) can be utilized for the generation of so called non-sounding products. In particular, it is possible to identify and discriminate snow and ice cover over the full range of snow conditions. Since the start of the first satellite of the Okean series in 1983, SRC Planeta has carried out satellite monitoring of ice conditions in the Arctic Region using side looking radar (SLR) data. A long-term archive of OKEAN satellite radar data allows one to perform a number of research and application tasks that require long-term sets of observation data, in particular, for climate change research. WG II commended ROSHYDROMET on the achievements made and the impressive suite of products.

G.II/1 Review of Actions from the Previous Meeting

A review of actions from CGMS-38 was made at the end of the session of WG II. The majority of actions had been addressed and closed some of them by papers presented in this session of Working Group II. It is recalled that the closing and status of actions is also recorded in the final report under a separate heading.

G.II/2 Image Processing Techniques

NOAA-WP-18 discusses special data sets that NOAA has collected from its most recently launched GOES-14 and GOES-15 geostationary satellites and has simulated for its future GOES-R Advanced Baseline Imager (ABI). This paper is in response to recommendation 38.08 asking NOAA to consider sharing 1 minute simulated imager upon request from CGMS agencies. These datasets bring new opportunities for the scientific advancement and improvement of products and services. NOAA's research and operational communities are working to exploit these opportunities. In the spirit of the scientific collaboration described above, NOAA expects and is willing to share these data with its partners in the CGMS community.

G.II/3 Satellite Data Calibration and Validation

CMA-WP-08 introduced the integrated calibration and quality control system established for the three FY-3A optical instrument (the MEdium Resolution Spectral Imager - MERSI, the Visible and InfraRed Radiometer – VIRR, and the InfraRed Atmospheric Sounder - IRAS) and reported on the calibration trends and anomalies of these instruments determined by a combination of methods. The monitoring results show that three bands (one IR and two shortwave infrared bands) of FY-3A/ MERSI appear to have abnormal, frequent fluctuations of their calibration because of random jumps of MERSI electronic gain on orbit. The calibration monitoring also shows that there is significant degradation in short wavelength bands (<500nm) of MERSI with more than 10% degradation whilst it is relatively stable for longer wavelength VNIR bands, with less than 5% degradation over three years. The biggest degradation, in band 8 of MERSI, is more than 25%.

WG II appreciated the information given by CMA on calibration trends of FY-3A instruments, and welcomed the anomaly alert provided for the benefit of users of FY-3A data.

In response to Action 38.20, **CMA-WP-09** reported on FY-3 microwave instrument calibration anomalies. It started with a briefing on the instrument status and informed CGMS that the MicroWave Temperature Sounder (MWTS), the MicroWave Humidity Sounder (MWHS), and the MicroWave Radiation Imager (MWRI) are the MW payloads on FY-3A and FY-3B satellites. The three instruments onboard FY-3A have some problems, but the ones on FY-3B work well. The paper then presented the histograms from the results of an integrated calibration and validation campaign for these three instruments in comparison with the corresponding instruments flying on the NOAA-18 satellite, and AQUA satellite, which showed good results when performing the O-B checks for MWHS with the NOAA-18/MHS corresponding channels at 183GHz. For MWTS on FY-3B, except for channel 4, the biases for channels 1-3 are smaller than or as much as AMSU-A on NOAA18. The paper gives the test results of MWRI with the conclusion that the in-orbit calibration of MWRI is stable, and the MWRI observation is highly consistent with that of AMSR-E and model simulation.

In the discussion, it was pointed out that the Community Radiative Transfer Model (CRTM) was used to simulate both imager and sounder radiances. For comparison with model fields, simulations from ECMWF and NCEP were used by CMA.

WG II noted with appreciation the report on FY-3A and B microwave instrument calibration results.

CMA-WP-10 described recent actions taken by the GSICS Processing and Research Centre (GPRC) at CMA. The progress of the CMA GPRC includes the geostationary imager calibration monitoring based on the operational GEO-LEO IR inter-calibration for FY-2D/2E satellites, and on the LEO-LEO inter-calibration experiment for FY-3A/3B using AIRS, IASI and MODIS. GSICS GEO-LEO IR inter-calibration for FY-2 has been running operationally at CMA since the end of 2009. FY-2C GSICS recalibration processing since 2005 is completed. The inter-calibration results for FY-2D/2E show that the FY-2E has significant improvement in stray light elimination. Therefore, more stable calibration results have been achieved when compared to its predecessors FY-2C/2D. Effort has been spent on real-time monitoring of the performance of FY satellites sensors, and operational development of LEO-LEO inter-calibration for FY-3A optical sensors such as MERSI, VIRR, and IRAS based on AIRS, IASI, MODIS and GOME-2.

The paper further summarised CMA's overall experience in the GSICS and plans for the near future.

WG II applauded CMA for its comprehensive report which demonstrates many of the benefits of participating in GSICS. The WG commended CMA for its active and growing role in GSICS.

CMA-WP-12 presented validation result of the FY-3B /Earth Radiation Measurement (ERM) scanner, by comparing it with the Aqua/CERES FM3 data. The radiative response of ERM showed significant change shortly after the launch of FY-3B, however, the instrument has become stable since January 2011. The ERM shortwave channel suddenly degraded in mid-July 2011 and remained without response to earth targets. Comparison with CERES shows an average bias about 2.67 and 5.72w/m2str for ERM total channel during night and daytime, and -2.46 W/(m2 sr) for ERM SW channel during daytime.

The WG II welcomed the report by CMA on the performance of the ERM instrument and encouraged continuation of this effort, given the high importance of Earth radiation budget measurements.

JMA-WP-04 summarised the GSICS and SCOPE-CM activities. JMA began operations of the MTSAT-1R infrared inter-calibration system on GSICS in 2008, and the system was modified on the occasion of the switchover to MTSAT-2 from MTSAT-1R in July 2010. The MTSAT IR GSICS Correction is now in the Demonstration Phase of the GSICS Procedure for Product Acceptance (GPPA). According to the inter-calibration between MTSAT and LEO satellite infrared channels, MTSAT-2 infrared brightness temperature data contain biases around midnight during the eclipse seasons. JMA has also reprocessed the calibrations of GMS-5 and MTSAT-1R visible images in collaboration with the University of Tokyo and Chiba University. With the switchover to MTSAT-2, the Agency began operational visible vicarious calibration and monitoring of its calibration coefficients. As a contribution to SCOPE-CM, JMA (re)processed the historical AMV and CSR dataset and made the results available to the re-analysis community. A study carried out using reprocessed GMS AMV data showed a significant positive impact. WG II very much welcomed the work of JMA. The paper also recalled previous requests and recommendations to regularly perform a reprocessing of AMVs and clear-sky radiances in support of re-analyses and the SCOPE-CM activities.

Recommendation 39.10: All AMV and CSR product providers are invited to continue or start the regular reprocessing of those products with state-of-the-art algorithms.

KMA-WP-06 described ongoing GSICS activities. KMA began to operate GSICS using COMS for IR inter-calibration system with LEOs (AIRS and IASI) after the completion of the IOT at the end of January. KMA

also performed visible channel vicarious calibration using the Australian Simpson desert region and deep convection cloud with Seoul National University. These GSICS S/Ws are for near real-time operation and results are posted on KMA/NMSC website. During 22-25 of March, KMA successfully hosted the GSICS Joint Research and Data Working Group meeting in Daejeon, Korea. WMO expressed its gratitude to KMA for providing continuing support to GSICS.

NASA-WP-07 provided an update of NASA Calibration and Validation activities. Recent NASA satellite and airborne instrument calibration and validation activities and assets of interest to the meteorological remote sensing community include the following: (1) improvement in the production of calibrated, geo-located (i.e. Level 1B) radiances from the Advanced InfraRed Sounder (AIRS) instrument on the Earth Observing System (EOS) Aqua satellite, (2) improvements in the production of calibrated, geo-located (i.e. Level 1B) reflectances/radiances from the Moderate Resolution Imaging Spectroradiometer (MODIS) on the EOS Terra and Aqua satellites, (3) the Committee on Earth Observation Satellites (CEOS) Visualization Environment (COVE) tool for satellite data acquisition planning and visualization, (4) the development of the Enhanced MODIS Airborne Simulator (eMAS), and (5) the development of the Airborne Visible/Imaging Infrared Spectrometer-Next Generation (AVIRIS-NG). These cal/val activities are essential for maintaining and improving the quality of the measurements and derived products for the life of the sensor.

Action 39.24: NASA and NOAA to report on cal/val results from the NPP instruments, including comparisons of NPP sensors with EOS sensors and with airborne instruments. Deadline: CGMS-40

Action 39.25: NASA to discuss with GSICS the use of COVE tool to facilitate sensor calibration and validation activities. Deadline: CGMS-40.

NOAA-WP-21 reported on the past year's calibration performance from NOAA instruments, as well as life-time performance, using the NOAA Instrument Calibration Validation System (ICVS) Instrument performance monitoring is critical for ensuring level 1b product quality for both numerical weather prediction and climate change detection. Since these products are increasingly dependent on data from the international constellation of Earth Observing Satellites, it is important to establish a central interface from which NOAA's instrument monitoring information can be easily accessed. This information is essential for the development of climate data records as well for real-time applications which relies on updated information on sensor performance. It also provides early warning of instrument problems, thereby enabling resolution in a timely manner when possible. In this paper, a comprehensive web-interface for real-time instrument performance monitoring, maintained, is introduced.

Recommendation 39.11: CGMS agencies are encouraged to provide instrument monitoring results at CGMS-40.

WMO-WP-03 presented the progress of Global Space-based Inter-Calibration System (GSICS) since CGMS-38, including:

- The completion and implementation of algorithms for intercalibration, including routine generation of correction coefficients, of the geostationary infrared imagers from EUMETSAT, JMA, NOAA, and shortly CMA and KMA, using EUMETSAT IASI and NASA AIRS hyperspectral infrared sounders as reference instruments;
- The development and implementation of the GSICS Procedure for Product Acceptance (GPPA) to review and document the GSICS intercalibration and correction algorithms;
- Establishment of the GSICS data servers, wiki pages, and individual operators' web sites for communication and data access;
- The addition of IMD, JAXA, and USGS as full members;
- A range of activities undertaken by the GCC, GRWG and GRDG;
- Feedback from the 3rd GSICS Users' Workshop.

The discussion highlighted EUMETSAT's and NOAA's work on intercalibration. It was noted that GSICS was a successful example of international collaboration between space agencies.

Recommendation 39.12: CGMS Satellite Operators to provide regular information on satellite/instruments events affecting calibration and establish corresponding websites.

Recommendation 39.13: CGMS Satellite Operators to provide Instrument Performance Monitoring information routinely on their respective websites.

Recommendation 39.14: CGMS Members participating in GSICS to provide a representative in the GDWG.

Recommendation 39.15: CGMS to support the development of guidelines by WMO for the design of future instruments with a view of harmonizing some spectral characteristics (e.g. central λ) of at least some core geostationary imager channels.

Recommendation 39.16: CGMS Members that are not currently participating to consider an active

role in the future progress of GSICS, enabling their sensors to be used for inter-calibration and to benefit from the experience collected in GSICS.

Action 39.26: NASA to ask GPM-XCAL team to review and consider use of GSICS Product Acceptance Procedure. Deadline CGMS-40

G.II/4 Infrared/MicroWave sounding and ITWG Matters

NOAA-WP-19 reported on NOAA's new stratospheric temperature climate data record derived from recalibrated Stratospheric Sounding Unit (SSU) observations NOAA/NESDIS has generated a 27-year (1978-2006) stratospheric temperature data record from Stratospheric Sounding Unit (SSU) observations for climate trend and variability detection. The dataset includes gridded global layer temperatures of mid-stratosphere, upper-stratosphere, and top-stratosphere. Calibration algorithms for developing the data record include corrections of gas leaking problem in the SSU instrument CO2 cells, variation of the atmospheric CO2 concentration, incident angle effect, diurnal drift effect, and Earth-location dependent residual inter-satellite biases. The products have a grid resolution of 2.50 latitude by 2.50 longitude and both monthly and pentad data are available for seamless climate monitoring. This is the first set of well-documented and well-calibrated global gridded dataset available to the climate community for long-term stratospheric temperature monitoring and investigation and for validating climate model simulations of the stratospheric climate change. For 1979-2006, the dataset had a global mean stratospheric temperature trend around -0.93 to -1.24 K/decade. Spatial trend pattern analyses indicated that this cooling occurred globally with larger cooling over the tropical stratosphere.

NOAA-WP-22 briefly presented an update on the International TOVS Working Group (ITWG). It was noted that the ITWG did not meet prior to CGMS-39. The next meeting ITSC-XV111 is 21-27, March 2012 in Toulouse, France.

Actions for ITWG from CGMS-38 were:

Action 38.23: ITWG rapporteur will provide actions related to calibration to GSICS.

Action 38.24: ITWG rapporteur will provide actions related to climate to SCOPE-CM.

Action 38.25: ITWG rapporteur and ITWG co-chairs to invite IMD and ISRO to consider participation in ITWG.

Actions 38.23 and 38.24 have been reported at GSICS and SCOPE-CM meetings.

With respect to Action 38.25, IMD and ISRO scientist have participated in past ITWG meetings and are encouraged to attend especially to highlight their new and pending satellites and to discuss GSICS related activities.

Recommendation 39.17: CGMS agencies are encouraged to support scientists to attend the next ITWG.

G.II/5 Precipitation and IPWG Matters

EUM-WP-19 reported on the Third International Workshop on Space-Based Snowfall Measurement. The paper presented the results of the Third International Workshop on Space-based Snowfall measurement which was held in March/April 2011 in Grainau, Germany. The workshop was endorsed by the International Precipitation working group (IPWG) the GEWEX Radiation Panel (GRP) and NASA's Precipitation Measurement (GPM) and CloudSat Mission. During the workshop the snowfall community expressed its confidence in the capabilities of space-borne multi-frequency Doppler radar for global snowfall measurement and they urge national space and science agencies to plan missions that implement this capability at a minimum. These capabilities could be greatly enhanced through the following technological advances: (1) reduced radar pulse width to enhance near surface detectability and (2) the inclusion of a sub-millimetre-wave radiometer to provide additional constraints on ice water path and constrain ice particle sizes. It was also stated that there is convergence on the importance of radars and radiometers in addressing the observational gaps left open by current missions. However, observations from lidar and far-IR passive sensors are useful (and necessary for certain goals) and they complement the radar and radiometer measurements. If such instruments cannot be included in a given mission, synergies with other missions operating in the same timeframe (e.g. A-Train) should be explored, encouraged and coordinated.

Based on this discussion, the following recommendations to CGMS operators were formulated:

Recommendation 39.18: The snowfall community is confident in the capabilities of Space-borne multi-frequency Doppler radar for global snowfall measurement and requests space research agencies to plan future missions that implement double-frequency capability as a minimum.

Recommendation 39.19: Space agencies should continue to favour integrated science teams that encompass the measurement, modelling and data assimilation communities through proposals, campaigns and free dataflow.

EUM-WP-26 described the creation of validation datasets for rainfall Products. The paper responded to CGMS action WGII 38.26 and described the precipitation validation datasets that are available at the South African Weather Service (SAWS), who operates a comprehensive rain gauge and radar network. SAWS has in the past contributed to the IPWG activities. In the discussion NOAA commented that they would also be very interested to get ground validation datasets, especially radar data, for verification of current and future satellite products. The WG concluded that the cooperation with SAWS would be a very good opportunity for the establishment of a satellite product test bed making use of the SEVIRI instruments data. This would offer the possibility for EUMETSAT and NOAA to test and further develop new products for use by African and other weather services. The WMO was asked to take the action to inform SAWS about this initiative for joint product validation. This collaboration can be achieved either in the framework of IPWG, or bilaterally with EUMETSAT, NOAA or other international partners.

Action 39.27: The WMO Space Programme to contact the South African Weather Service (SAWS) to inform them about the interest of NOAA and EUMETSAT to closely cooperate with SAWS on satellite product validation, especially for precipitation products. Deadline: CGMS-40.

NASA-WP-06 provided a comprehensive report on NASA's contributions to precipitation remote sensing. The Tropical Rainfall Measuring Mission (TRMM), launched in late 1997, is a joint mission between NASA and JAXA, the Japanese space agency. The first-time use of both active and passive microwave instruments and the processing, low inclination orbit (35°) have made TRMM the world's foremost satellite for the study of precipitation and associated storms and climate processes in the tropics. TRMM has met and exceeded its original goal of advancing our understanding of the distribution of tropical rainfall and its relation to the global water and energy cycles. TRMM has evolved from an experimental mission focusing on tropical rainfall climatology into the primary satellite in a system of research and operational satellites used for analyzing precipitation characteristics on time scales from 3-hr to inter-annually and beyond. Continuation of TRMM data will allow the community to better link the TRMM data set to that of the Global Precipitation Measurement (GPM) mission to be launched in 2013.

The primary TRMM instruments are the Precipitation Radar (PR), the first and only rain radar in space, and the TRMM Microwave Imager (TMI), a multi-channel passive microwave radiometer, which complements the PR by providing total hydrometeor (liquid and ice) content within precipitating systems. The Visible Infrared Scanner (VIRS) is used to provide the cloud context of the precipitation structures and is used as part of a transfer strategy to connect microwave precipitation information to infrared-based precipitation estimates from geosynchronous satellites. These three instruments form the original TRMM rain package and are used singly and jointly to understand precipitation processes, structure and climatology. In addition, the Lightning Imaging Sensor (LIS), an Earth Observing System (EOS)-funded instrument, has complemented the rain sensors, improved understanding of convective dynamics, and provided a climatology of global lightning flash rates.

As part of the original 3 years of the mission NASA funded field experiments as part of TRMM. These experiments focused on the microphysics of weather systems. Their aim was to provided information that would improve the TRMM retrieval algorithms as well as provide comparative data points. This combination of ground validation and space mission is part of the synergistic approach to NASA mission planning. Four important field experiments were funded: TEFLUN-A/B, TRMM-LBA, KWAJEX. All contributed to continuous improvement of TRMM retrieval algorithms as well as increasing our understanding of weather in the tropics. The follow-on activities by GPM will also include validation campaigns.

Recommendation 39.20: CGMS agencies are encouraged to follow NASA's example of comprehensive and sustaining science support for satellite missions, including comprehensive validation campaigns.

NOAA-WP-23 reported on issues related to obtaining rainfall datasets over South Africa for validating NOAA and EUMETSAT satellite rainfall products. Because the intensity and frequency of rainfall and the physical mechanisms involved (e.g., convective vs. stratiform; orographic enhancement via the "seeder-feeder mechanism") varies considerably in both time and space, validation data are needed over as wide a variety of climate regimes and seasons as possible to develop robust algorithms and properly evaluate their performance. However, obtaining ground validation data sets of suitable quality at short time scales (instantaneous to 3 h) has proven to be exceedingly difficult. The Nimrod radar/gauge data set provided by the British Atmospheric Data Centre (BADC) has provided excellent ground validation data for all 3 GOES-R algorithms over Western Europe, while

the Tropical Rainfall Measuring Mission (TRMM) Precipitation Radar (PR) has been highly useful for validating the Rainfall Rate algorithm over the tropics and lower midlatitudes. However, high-quality rainfall data sets have otherwise been quite difficult to obtain aside from very limited data sets associated with field campaigns such as the NASA African Monsoon Multidisciplinary Analyses (NAMMA) and the planned Chuva project over Brazil.

Therefore, collaboration among EUMETSAT, NOAA, and the South African Weather Service to develop a high-quality validation data set for satellite rainfall product development and validation would be highly valuable to the research and operational communities. NOAA intends to participate in any proposed collaboration.

WMO-WP-20 reported on activities of the International Precipitation Working Group (IPWG). Special emphasis was given to recent achievements, especially:

- IPWG compiled lists of publicly available, quasi-operational and quasi-global precipitation datasets which is available through the IPWG Web site at: http://www.isac.cnr.it/~ipwg/data/datasets.html.
- PWG had carried out a survey of different sources of validation rainfall data; the datasets lists are also available on the Web site together with a list of applications using high resolution satellite precipitation products.

IPWG also asked CGMS operators to conduct the following action.

Action 39.28: Satellite operators are requested to provide funding for participants of the 6th IPWG Workshop which will take place in Fortaleza, Brazil (tentatively 15-19 October 2012). Deadline: 30 June 2012.

Recommendation 39.21: CGMS members are invited to assist the funding of a training event which is planned to be held concurrently with IPWG-6.

The WGII appreciated the good work done by IPWG and complemented them on their recent activities.

G.II/6 Atmospheric Motion Vectors and IWWG Matters

EUM-WP-27 presented the status of preparations for the 11th International Winds Workshop to be held in 2012. The biennial International Winds Workshops are the fora used by the International Winds Working Group (IWWG) for co-operation in the operational and research community, and have strongly contributed to the improvement in the quality of the derived wind fields. This paper announced the 11th Workshop of the International Winds Working Group (IWW11) to be held in Auckland, New Zealand from 20 - 24 February 2012. The workshop is hosted at the University of Auckland by Prof. Roger Davies. The paper recalled the background of relevant activities that were discussed and put into action at earlier CGMS meetings and Wind Workshops. The paper also put forward additional topics for discussion at CGMS 39 in WGII with the suggestion to consider those topics for further elaboration at IWW11. Working Group II acknowledged the progress that had been made notably on i) the stand-alone software for the derivation of AMVs and ii) on plans for a second AMV intercomparison. Both topics were highlighted with separate working papers from EUM presented below. Working II also advised that the various questions and topics listed in EUM-WP-27 under sections 2 through 4 should be pursued further at the next Winds Workshop. It was understood that the coherent incremental progress that is being made by the satellite AMV provides is key to future improvements on AMVs which will substantially benefit NWP users.

The rapporteur for the IWWG presented a short power point presentation on recent AMV impact studies have been performed by Dr. Carla Cardinali at ECMWF which demonstrated the beneficial impact of GOES, Meteosat and Modis AMVs on the quality of ECMWF forecasts. A novel aspect of the impact study is the slicing of the AMV observations into different contributors and also into different height levels. The detail of such study should provide better guidance on critical areas that need further investigations. WG II did express special thanks to Dr. Cadinali for her efforts. The subsequent discussions suggested that this type of work should be extended to AMVs from other satellite operators. It was also recommended to ask other NWP centres to perform similar studies of the impact studies AMVs in their weather forecasting models.

Action 39.29: All AMV providers to make efforts to have the quality of their products tested by NWP centres. The slicing into specific AMV products (e.g. from WV or IR channels) and segregation into vertical levels is advised. Deadline: CGMS-40.

Recommendation 39.22: All AMV providers should make an effort to have the quality of their products tested by NWP centres. It is recommended to present such results already at the 11th International Winds Workshop in February 2012.

Recommendation 39.23: CGMS-39 advised IWWG 11 to further address the salient issues and topics

listed in EUM-WP-27.

Action 39.30: The co-chairs of IWWG and the rapporteur are requested to discuss the results from NWP impact studies at IWW11, and to synthesize general observations on performance. Due date: IWW11 in February 2012 and report to CGMS-40.

Recommendation 39.24: CGMS agencies are encouraged to support scientists to attend the next IWWG meeting.

Finally the rapporteur explained that the 5th WMO Workshop on the 'Impact of Various Observing Systems on NWP' will be held in Sedona, Arizona, USA from 22-25 May 2012. This will be an additional opportunity to report on and compare results of impact studies in a broader context.

In response to Action 38.27 **EUM-WP-28** presented the IWWG Work Plan for a Second AMV Inter-Comparison Study. The main objective of the initial AMV inter-comparison study was to compare the operational algorithms of all satellite wind producers including the height assignment of AMVs from clouds using a common data set from SEVIRI on MSG, and the same ancillary data. AMVs generated from a common MSG-SEVIRI dataset (18 August 2006) by five AMV producers – EUMETSAT, NOAA-NESDIS, JMA, KMA, and the Brazilian Meteorological services, were inter-compared. The study assessed how the various AMV producers' data inter-compare in terms of global coverage, speed and direction.

While the initial study demonstrated the potential usefulness of the strategy, it also raised questions in a number of areas that require further study. In addition some operational algorithms have changed since the end of the first study and it will be beneficial to update results.

Action 39.31: IWWG co-chairs and the rapporteur are requested to report to CGMS 40 on the 2nd AMV intercomparison campaign. Deadline: CGMS-40.

EUM-WP-29 responded to Action 38.29 and reported on a validation campaign for AMVs Derived with the NWCSAF Portable AMV Software Package. The paper briefly described the SAFNWC HRW software, and gave an overview on the scientific validation of the last version of the SAFNWC HRW software. WG II very much welcomed the effort and asked for a continuation of the joint efforts at IWW11. It was also asked whether and when the stand-alone software will be extended to include AMVs from clear-sky water vapour fields.

Recommendation 39.25: CGMS Agencies are invited to:
i) further test the performance of the NWCSAF AMV software package by testing the products in a NWP data monitoring/assimilation system, and
ii) extend the current software to clear-sky WV AMVs.

IMD-WP-01 presented the retrieval and validation of Atmospheric Motion Vectors from the Indian National Satellite System KALPANA-1. The India Meteorological Department has been processing 3 Channel Very High Resolution Radiometer (VHRR) data from KALPANA-1 and INSAT-3A Satellites since September, 2002 and April 2003 respectively. The retrieval of Atmospheric Motion Vectors using Infrared and Water vapour channels is one of the products derived from the KALPANA-1 Satellite. Three consecutive images at 30-min intervals are used to determine the AMVs. The following steps are involved in this process: 1) image "thresholding," 2) feature selection and tracking for CMV/WVW extraction, 3) use of image triplet and basic quality control, and 4) height assignment. An empirical height assignment technique based on a genetic algorithm is used to determine the height of cloud and water vapour tracers. The winds have been validated using 62 radio-sonde stations data according to the CGMS criterion. The validation procedure and results obtained for a two-year period, September, 2009 to August 2011 were presented in this paper. The results indicate that North of 20 deg. N, a definite seasonal variation is observed in the RMSE error and Bias values of the wind fields derived from the IR and WV channel data. The RMSE error values decrease in summer months, while the bias values become more negative when compared to winter months. This is in agreement with corresponding observations made by other AMV providers. The overall improvement in the error values, especially in high level winds over the period indicates that the data is suitable for assimilation into NWP models as well as input for synoptic forecasting. IMD was commended on the progress.

JMA-WP-05 reported on the recent status of JMA's AMVs from MTSAT-2 and MTSAT-1R, and outlines responses to Recommendations 38.14 and 38.15 JMA's Meteorological Satellite Center increased the frequency of AMV dissemination via the GTS in March 2011. Although AMV data from MTSAT-2 computed on an hourly basis were previously used only internally, they are now disseminated every hour via the GTS in BUFR format.

In response to CGMS Recommendation 38.14, this report outlined the results of an impact experiment conducted during the THORPEX T-PARC campaign of 2008 on Rapid Scan AMVs derived from MTSAT-2 and used in JMA's NWP. It was found that the assimilation of these AMVs improved typhoon track forecasting.

In line with Recommendation 38.15, JMA plans to examine the efficiency of the NWC-SAF portable AMV software package. This test is expected to significantly contribute to the improvement of JMA's AMVs.

JMA currently computes Rapid Scan AMVs from images taken at five-minute intervals by MTSAT-1R. These vectors will be useful for the development of next-generation AMVs applicable to JMA's follow-on satellite observations. WG II noted with pleasure the progress that has been made by JMA on AMVs from rapid scans. Furthermore it noted the plans of JMA to examine the NWCSAF AMV software.

Recommendation 39.26: Satellite AMV providers are invited to examine the stand-alone AMV software package from the NWCSAF and to report back to CGMS 40.

KMA-WP-08 discussed he ccurrent status of Atmospheric Motion Vector derivation at KMA. The working paper looked at errors of AMVs estimated by KMA in terms of latitudinal band, AMV heights, assigned methods for AMV height and time etc. These results are very helpful when trying to understand the characteristics of AMV errors when used for NWP data assimilation and when used to improve the AMV estimation algorithm, itself. WG II noted that the studies are a useful complementary activity to the NWP impact studies discussed above.

NOAA-WP-34 discussed NOAA/NESDIS' interest in the EUMETSAT NWC SAF's Atmospheric Motion Vector portable software. More specifically, this AMV software package presents an opportunity for NOAA/NESDIS AMV algorithm experts to increase their collaborations with AMV algorithm experts not only at EUMETSAT and the NWC SAF AMV, but also with AMV algorithm experts at the other satellite AMV processing centers or universities. It is envisioned that such collaboration could involve sharing and joint testing of new algorithm approaches as well as inter-comparisons of output obtained from NOAA/NESDIS' and NWC SAF AMV algorithms. A shared goal of such collaborations would be to further improve the performance and utility of operationally derived AMVs.

A good example of potential collaboration that comes to mind is sharing of algorithm approaches and data that would allow for inter-comparisons between EUMETSAT's new CCC AMV height assignment scheme that was recently implemented in the NWC SAF AMV software and NOAA/NESDIS' new AMV algorithm it developed for its future GOES-R Advanced Baseline Imager. It may be possible to share pieces of AMV algorithm codes and data for purposes of collaborative testing, improved understanding, and future algorithm enhancements.

Recommendation 39.27: EUMETSAT NWC SAF to consider providing a tested option to allow running of alternative algorithms to support algorithm intercomparisons studies.

G.II/7 Radio Occultation and IROWG Matters

The International Radio Occultation Group (IROWG) was established as a permanent Working Group of CGMS at the 37th meeting on 26-30 October 2009 (Jeju Island, South Korea). The IROWG is co-sponsored by CGMS and the World Meteorological Organization (WMO). The IROWG serves as a forum for operational and research users of radio occultation data.

The IROWG intends to build upon the expertise of scientists who are currently involved in the use and analysis of radio occultation data. It is established to foster the:

- Development of better measurements, and improvement of their utilization;
- Improvement of scientific understanding;
- Development of international partnerships.

The Working Group is comprised of representatives nominated by the satellite operators of the CGMS, other members of CGMS and relevant research satellite operator, as well as the general RO science community. Following the current highly successful practice in ITWG, IWWG and IPWG, the Working Group, shall also be widely open to participation from any representative of the user community expressing interest and/or willing to contribute to RO science and its applications.

Action 39.32: CGMS agencies are encouraged to participate in the next International Radio Occultation Working Group (IROWG) Workshop to be held in Estes Park, Colorado 28 March - 3 April, 2012. Details can be found at www.irowg.org. Deadline: 01 March 2012

IMD-WP-02 presented a case study of GPS Meteorology addressing the under estimation of IPWV (integrated precipitable water vapour) by ground based GPS system in some meso-scale Thunder storms. In normal atmospheric condition nearly 50% of water vapour in the atmosphere is between sea level and 1.5 km above sea level. Less than 5 % is between 5 to 12 km above sea level and less than 1% in the stratosphere. Active weather is strongly correlated to the water vapour distribution in the atmosphere. The conventional method of measurements of water vapour does not normally have a resolution high enough to resolve these variations. Its accurate measurement is

very important when making weather forecasts and nowcasting. In recent years techniques have been developed for remote sensing of integrated precipitable water vapour between the ground based Global positioning system (GPS) receivers and the GPS satellites with an accuracies of the order of less than 1.5 mm comparable to radiosondes and water vapour radiometers. In the present work we have studied three similar meso-scale thunderstorm events that occurred over the GPS station during Indian summer monsoon in which GPS underestimate precipitable water in one of the events which is of the order of more than 20 mm (or of the order of 130 mm in ZWD). IMD has analysed various sources of error such as azimuthal symmetry of the atmosphere, errors in determining the mean temperature of the atmosphere, the hydrostatic approximation, horizontal gradients etc. It is concluded that for the fast developing thunder clouds the number of GPS satellites which are spanning the atmosphere and the size of the thunder cells play a major role in determining the accuracy of precipitable water vapour using GPS.

NASA-WP-03 reported on radio occultation activities at NASA. NASA/JPL has been involved in radio occultation (RO) science since its early demonstration and development on planetary missions in the 1970s. NASA's instrument design is the basis for operational assimilation of RO data from the following missions: COSMIC, CHAMP, SAC-C, C/NOFS, GRACE, and TerraSAR-X (CHAMP is now de-orbited). NASA is currently developing a next-generation instrument for planned Earth science missions, to increase science return from transmissions of Global Navigation Satellite Systems (GNSS), broadly defined to include reflections and other possible applications. The new instrument, "Trig", will benefit the operational community with the following capabilities:

- Frequency agility to receive GPS L1/L2/L5, Galileo E1/E5 and GLONASS, increasing the number of assimilated observations;
- Multi-element actively steered antenna arraying capability that increases data precision while accommodating a wide variety of constraints on the antenna form factor;
- 50-100 Hz data rate in open loop mode to accommodate a variety of mission link budgets;
- Access to 1000 Hz raw data onboard to accommodate custom algorithms that can be developed and executed in a Linux-based science processor;
- 24 dual-frequency channels to acquire "all-satellites-in-view" for two full GNSS constellations.

The first engineering model of the Trig will be available in 2012. NASA has agreed to work with NOAA to provide Trig for the follow-on FORMOSAT-7/COSMIC-2 constellation. NOAA is procuring flight models of the Trig for delivery in 2013 to the FORMOSAT-7/COSMIC-2 project. Trig is being developed with a commercial partner. It is recommended that, whatever the manufacturing source, science instruments be delivered by institutions with experience in the science applications.

New opportunities to host RO instruments on appropriate missions are under active consideration by the RO community. The Korean KOMPSAT-5 mission has purchased a modified NASA-designed receiver from Broad Reach Engineering, possibly representing another source of operational data. NASA recognises that hosting opportunities increase as resource requirements go yet lower. JPL is currently considering advances in GNSS RO technology that have reduced power and mass requirements while preserving most functionality of the Trig instrument. Their ability to pursue such approaches is dependent on availability of funding.

NASA is commended for pioneering and continuing to develop and promote cost-effective and easily accommodated GNSS instruments and its collaboration with other agencies to allow for increased use of RO measurements to improve both weather and climate applications.

Action 39.33: CGMS agencies are encouraged to report scientific progress on use of Radio-occultation, opportunities to provide increased coverage by RO sensors as well as to report on data gap issues to the IROWG, and directly to CGMS. Deadline: CGMS-40.

G.II/8 Cloud and Ash/Dust related Matters

CMA-WP-13 reported on Satellite Volcanic Ash monitoring and Operational Service and the recent work at CMA that tries to establish the warning and dynamic monitoring of volcano ash. Following a set of method tests on recent volcano activities and comparison of results, the paper finds that the SWIR-TIR Volcanic Ash (STVA) method based on FY meteorological satellites data has the advantage of being able to identify volcanic ash cloud under complicated weather conditions, and has the potential for future operational use for the warning and dynamic monitoring of volcanic ash. First results using the example of the ash cloud from the Eyafyalla eruption in April 2010 were presented.

WG II commended CMA for undertaking methodological studies on the detection of volcanic ash from its polar and geostationary satellites.

CMA-WP-14 summarised work on Operational Dust Storm Remote Sensing. Specifically the working paper reported on CMA work to monitor the outbreak and extension of dust storms from satellites. It mentioned that dust monitoring is one of operational tasks of NSMC and describes the method to identify the outbreak of a dust storm and the quantitative algorithm to retrieve the optical depth and particle size. The working paper also noted that the identification and quantitative retrieval algorithm has been integrated into the CMA operational system for dust storm monitoring. During the discussion, CMA informed CGMS that validation of dust storm products was being performed using meteorological visibility of ground station as well as by assimilating results in aerosol/dust atmospheric transport model. CMA clarified that two IR channels are used to for the quantitative retrieval of aerosol parameters.

WG II welcomed the well-presented report on the methodology employed by CMA for operational dust storm detection.

CMA-WP-15 provided a report on the Operational Use of Satellite Data for Nowcasting Convective Cloud Systems. It described the operational use by CMA of satellite data for nowcasting. Satellite data in operational use for nowcasting is primarily used to identify, track and warn of convective clouds. At CMA, the monitoring and tracking of convective systems is mainly done using geostationary meteorological satellites, and operationally uses a suite of methods to identify and track convective clouds. Based on the results of tracking, indicators for the physical characteristics of the convective cloud can be derived, such as the lowest and the highest temperature, the mean and the gradient brightness temperature of convective cloud. By the cloud shape, the centre of gravity, centroid, area and profile can be obtained. All these information are provided to forecasters for reference.

WG II highly appreciated the briefing by CMA on methods to identify and track convective clouds.

EUM-WP-14 reported on the current support to the Working Group for Nowcasting Research of the World Weather Research Programme (WWRP-WGNR). This Working Group for Nowcasting Research (WGNR) is a part of the WMO World Weather Research Programme. Established in 2001, past activities of the group encompassed nowcasting Demonstration Projects, including necessary training. The Nowcasting Research Working Group had realised that knowledge of potential of satellite observations for nowcasting purposes had not been well represented and thus asked for the participation of a EUMETSAT representative in the group. In a recent WGNR meeting, EUMETSAT and NOAA informed the group about the nowcasting capabilities of MSG and of the future GOES-R and MTG programmes. The value of these observations on otherwise data sparse regions (e.g. Africa and parts of South America) was highlighted and acknowledged by the Working Group.

EUM-WP-30 reported on capabilities and plans to support volcanic ash monitoring. Following the raised interest in quantitative volcanic ash information derived from satellite observations after the 2010 Eyjafjalla eruption, EUMETSAT commissioned two science studies with the aim of exploring the information content of Metesoat Second Generation (MSG) observations in this respect. It was shown that total ash loading can be retrieved with good detection capabilities and accuracy, while other parameters need a more sophisticated approach. The paper provided a short summary of the two studies, including some sample results and presents EUMETSAT plans for an operational provision of volcanic ash products. The paper also summarises the volcanic ash related activities based on the use of Metop data. WG II expressed interest in this work and asked specific questions on the ash cloud retrieval including the data bases on refractive indices.

EUM-WP-32 summarised nowcasting applications, including Cloud Analysis, Fog Detection and Forest Fires. The overview summarised established nowcasting applications based on Meteosat Second Generation (MSG) observations. These applications range from the use of pure imagery data, mainly based on channel combinations as e.g. channel differences or RGB composites, to more elaborate higher level products. A wealth of nowcasting products is provided through the software of the EUMETSAT Satellite Application Facility in Support to Nowcasting and Short-Range Weather Forecasting (NWC-SAF), but also through products derived centrally at EUMETSAT and made available to users through EUMETCast. The paper also provided examples of recent activities, initiated through collaboration with individual weather services or other science groups.

JMA-WP-08 addressed nowcasting products based on MTSAT-1R Rapid Scan Observations. The document reported on JMA's MTSAT-1R Rapid Scan (RS) operation activities and nowcasting products produced using related data. Since 7 June, 2011, JMA has disseminated information on clouds around Japan to aviation users. The data used comes from RS observations made at five-minute intervals, and are also adopted for the formulation of a nowcasting product to detect rapidly developing cumulus areas (RDCAs). JMA is also preparing to provide information on cumulonimbus cloud areas in addition to the cumulus cloud information from summer 2012. In addition, RS observations were carried out at 10-minute intervals using MTSAT-1R from February to May 2011 to monitor

the distribution and diffusion of volcanic ash.

KMA-WP-09 reported on the current status of weather forecast support for nowcasting and very-short range forecasts. KMA has improved its satellite image analysis technique through the introduction of new, advanced skills provided by the NWCSAF of EUMETSAT.

WG II acknowledged the improvements in KMA's satellite image analysis techniques, and encouraged further work to advance analysis methods for nowcasting and very short-range forecasting.

NASA-WP-04 provided an overview of NASA satellite observations of clouds, ash, and dust. NASA Earth observation satellites have contributed immensely toward effective monitoring of meteorological and other physical phenomena that affect the Earth system. Numerous operating satellites and instruments are currently used for this purpose. The parameters routinely observed by NASA satellites include optical depth or thickness, particle/droplet/crystal type or shape, effective radius (of aerosol particles or cloud droplets/crystals), size distribution, layer height, layer thickness, vertical distribution, among others.

The sensors and instruments that are most responsible for NASA's contributions to cloud observations include the Moderate Resolution Imaging Spectroradiometer (MODIS on Terra and Aqua); Multi-Angle Imaging Spectroradiometer (MISR on Terra) Atmospheric Infrared Sounder (AIRS); Cloud-Aerosol Lidar and Infrared Pathfinder Satellite (CALIPSO); and Cloudsat.

Data from MODIS, MISR, and CALIPSO, together with that from the Ozone Monitoring Instrument (OMI on Aura) provide a variety of information about aerosols, with particular synergy coming from the near coincident measurements made by Aqua MODIS, CALIPSO, and OMI as part of the A-train. Aerosol properties determined from these measurements include total column, mid-visible, aerosol extinction optical depth or thickness, as well as additional parameters (aerosol type and shape, refractive index, effective radius, size distribution, scattering, and absorption properties, although these are produced typically with larger uncertainty than optical depth). MISR can also provide information on aerosol plume height near wildfire, volcano, and desert dust data sources, and CALIPSO provides mapping of aerosol vertical distributions as well as recognition of multiple aerosol layers.

A number of NASA's cloud and aerosol date are being used operationally, with particular examples being in weather forecasting, air quality forecasting, aerosol assimilation, outreach and education, international partnerships in data delivery and utilization, and several community-based and international assessments.

Particular areas of scientific study being addressed with NASA data include volcanic ash plumes, biomass burning smoke emissions, and aerosol-cloud interaction.

NASA continues to plan for the eventual implementation of the GeoCAPE mission, a geostationary satellite to study atmospheric composition including aerosols; that was suggested by the US National Research Council in its 2007 Decadal Survey for Earth sciences. While current plans do not have a launch data scheduled, small investments are being made through the flight program, with additional investments made by NASA's Earth Science Technology Office.

NOAA-WP-24 provided an overview of differing regional capabilities in satellite-based volcanic ash cloud detection. Satellite capabilities relevant to volcanic ash cloud tracking are not globally uniform, and thus vary across (or even within) areas of responsibility of the nine Volcanic Ash Advisory Centres (VAACs). \ The paper describes how regional variations in satellite-based ash cloud tracking capabilities impact VAAC operations and summarizes how regional satellite capabilities will change as new satellites are placed into operations over the next 10 years. In order to ensure that volcanic clouds have a chance to be skillfully tracked regardless of location, the global satellite constellation must continue to evolve as currently planned VAACs need easy access to both GEO and LEO products in a manner that is sensitive to infrastructure limitations. Volcanic cloud monitoring would greatly benefit from high-spectral-resolution infrared measurements in geostationary orbit and highly elliptical orbits that provide improved coverage of high latitude regions. n recognition of the need to better observe the Arctic from space, the Canadian Space Agency, in partnership with Environment Canada, are planning the Polar Communications and Weather (PCW) mission. PCW will consist of two satellites in a HEO orbit over the North Pole. The PCW spacecrafts will include a GOES-R-like visible/near-infrared/ infrared sensor that is capable of providing 15-minute coverage (in the two satellite configuration) of the Arctic, which includes all areas north of 50o latitude, with a spatial resolution of at least 3 km. Given that many volcanoes in the North Pacific and on Iceland reside north of 50° latitude, these satellites will be extremely valuable to all northern hemisphere VAAC's. Currently, the first satellite of the PCW mission is scheduled to be launched in 2017. High temporal refresh is needed to provide the necessary early warning needed to alert the aviation community of risk to aircraft and also provide early warning to the general public to exposure to volcanic ash fallout.

Action 39.34: CSA and Environmental Canada to discuss volcanic ash detection and composition

products from PCW, and plans to provide rapid transmission of volcanic eruption alerts to the Northern Hemisphere VAACs. Deadline: CGMS-40.

NOAA-WP-26 reported on progress in the development of a NearCasting system to provide forecasts between 1 and 9 hours. Unlike Nowcasts, which generally provide 0-2 hour guidance based on extrapolations of radar and satellite observations after clouds appear, the NearCasting system uses multi-spectral infra-red geostationary satellite products to understand the detailed moisture and stability structure of the atmosphere 1-9 hours before storms form. The NearCasting system is designed to detect and retain extreme variations in the atmosphere (especially moisture fields) and to incorporate large volumes of perishable high-resolution a-synoptic data. This requires extremely computationally efficient numerical approaches that are notably different from those used in numerical weather prediction, where the forecast objectives cover longer time periods. Two cases studies over the US Midwest and Poland demonstrated improvements in forecasting severe events several hours after the detection of large instability in clear sky conditions.

Recommendations from the paper included:

1. Building upon the results of tests in the U.S., develop training for other portions of the globe covered by geostationary multi-spectral imagers/sounders and perform testing in other Meteorological services. (Real-time tests using SEVIRI data are being discussed with EUMETSAT.)
2. Perform tests in a variety of geographical and climatological areas, especially those without regular radar coverage.
3. Expand applications areas to include aviation forecasts (especially in less- developed countries without radar), heavy precipitation forecasts and marine forecasts.
4. Based on positive test results: Include NearCasting training in the “Virtual Laboratory,” and Make NearCast products readily available to all users via the internet.

Recommendation 39.28: NOAA/CIMSS to report on additional case study results using NearCasting, and, if practical, to include collaboration with the Severe Weather Forecasting Demonstration Project (SWFDP) for the Lake Victoria region. Deadline: CGMS-40.

G.II/9 Ocean Parameters

EUM-WP-13 provided a report on Ocean Products including those from the OSI SAF. Those products and services from the EUMETSAT Distributed Application Ground Segment include a number of oceanic parameters that are retrieved from satellite data. The Application Ground segment consists of a Central Application Facility (CAF) located at the EUMETSAT headquarter in Darmstadt and eight Satellite Application Facilities (SAFs) within the EUMETSAT member states. The SAF Network includes a dedicated SAF on Ocean and Sea Ice (OSI SAF). This document lists the ocean products of the CAF and the OSI SAF products and points to more detailed information available in the Web or in other documents.

In **JMA-WP-10** activities were described on the development of new multi channel sea surface temperature (SST) algorithm. The document reported on JMA’s activities for the development of a new sea surface temperature (SST) algorithm and its application to MTSAT data. JMA has operationally retrieved SSTs from GEO data since GMS-5 was launched in 1995. These SSTs indicate good performance for ocean monitoring status, but additional efforts to reduce bias are necessary. JMA has now developed a new algorithm as a theoretical extension of the traditional multi-channel sea surface temperature method (MCSST). Its application to MTSAT-2 data is expected to improve the calculation of water vapour absorption and sea surface emissivity. The cloud screening method used has also been improved. WG II commended the efforts and asked whether a comparison with other satellite products could be done.

Action 39.35: JMA is invited to present an intercomparison of the new MTSAT SST product with other (similar) products. Deadline: CGMS-40.

NASA-WP-05 reported on NASA’s program of breakthrough research to advance fundamental knowledge on the most important scientific questions on the global and regional integrated Earth system. The oceans are a major component of the global integrated Earth system, continually interacting with land and the atmosphere. NASA’s goal is to understand the changing ocean environment and its interaction with life.

NASA’s ocean research program is unique because it encompasses the development of observational techniques and the instrument technologies needed to implement them; laboratory testing and demonstrations from an appropriate set of surface-, aircraft-, and space-based platforms; development and operation of satellite missions and production and dissemination of resulting data products; research to increase basic

process knowledge; incorporation of observations and research results into complex computational models that can be used to more fully characterise the present state of the environment and contribute to predictions of future evolution of the global integrated Earth system; and, development of partnerships with other national and international organizations that can use the generated information in environmental forecasting and in policy, business and management decisions.

NASA satellite ocean and ocean-related measurements are chlorophyll-a, clouds, gravity, rainfall, sea ice, sea surface salinity, sea surface temperature, sea surface topography, sea surface wind speed, seasurface wind vector, and sea surface radiative fluxes. Ten of NASA's fifteen on-orbit satellites record one or more of the ocean and ocean-related variables. For example, sea surface salinity is recorded by only the Aquarius instrument on the Argentine SAC-D satellite but clouds are recorded by five missions. Nine of the ten missions with ocean and ocean-related satellite measurement capabilities have extensive partnerships with space agencies in other countries. For example, France and Japan are each partners with NASA on three different satellite missions. NASA data are freely available and website addresses to encourage utilization of these data were presented. Additionally, the website with information on the management of NASA's Earth Ocean and ocean-related missions was given."

Highlights of NASA ocean science and technology activities in 2010-2011 were described. In September 2010, all ocean and ocean-related missions were extended for two years. In 2010, there were nearly 400 science and technology projects related to ocean science and technology. On 9 June 2010, NASA launched the Argentine satellite SAC-D with the NASA Aquarius instrument to measure sea surface salinity. The "first-light" image of the global sea surface salinity distribution was shown for 25 August - 11 September; the chart contained more sea surface salinity measurements than ever recorded by ships and other in-situ platforms. After the end of the ICESat mission on 11 October 2009, NASA initiated the IceBridge airborne mission to continue some critical ICESat measurements. NASA aircraft have flown and will continue to fly along ICESat groundtracks in October-November over Greenland and the Arctic Ocean and in March-May over Antarctica. The NASA QuikSCAT mission contributes brightness temperature measurements for calibration of ISRO's OSCAT. At the end of October 2011, NASA will launch the NPP mission. The talk concluded with the nearly 20-year global sea level time series that began as a research measurement capability and now has become an operational measurement capability, which provides an excellent model for sustaining high accuracy, high precision satellite measurements for long periods."

WMO-WP-21 reported on Satellite Products in support of the SWFDP requirements for the Great Lakes and Coastal Areas in Tropical Regions. The paper provided information on the Severe Weather Forecasting Demonstration Project (SWFDP) developments in Eastern Africa and describes its needs for satellite products for the Lake Victoria Basin region, which will improve severe weather forecasting in this region, and thereby will support various socio-economic sectors and application areas, including hydrology (e.g. in flood monitoring and forecasting) and water resources, agriculture and fisheries, and maritime safety, in addition to the general public. Particular interest is expressed for cloud products, rainfall estimation, wind speed and direction over the lake basin region, soil moisture in the lake basin region, lake bathymetry, lake surface temperature, lake water level, and wave height and direction in the lake.

EUMETSAT commented that the cooperation on provision of satellite products in support to the Lake Victoria project would be another opportunity for strengthening the use of satellite data in Africa with the aim to enhance the warning capabilities for disaster mitigation purposes. Furthermore the methodologies and training capabilities of the WMO VLab could be used to support the SWFDP.

In support of the Project, NOAA indicated its willingness to undertake, in coordination with SWFDP, a nearcasting experiment in the Lake Victoria region (cf. NOAA-WP-26, author: Ralph Petersen, CIMSS Madison, US).

Recommendation 39.29: CGMS Satellite Operators are invited to advise on satellite products that could be made available in response to the needs of the SWFDP – Eastern Africa, to facilitate the timely provision of such satellite-related information, and to consider the SWFDP needs for the Lake Victoria Basin region in future product development activities.

Action 39.36: VLab co-chairs to address the potential of training support with the SWFDP responsible in WMO. Deadline: CGMS-40.

WMO-WP-30 discussed the Requirements for Satellite Information for Coastal Inundation Forecasting and Warning. The Coastal Inundation Forecasting Demonstration Project (CIFDP) was initiated jointly by the Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM) and the WMO Commission for Hydrology (CHy), aiming to provide an example of cooperative work as a strategy for building improved operational forecast and warning capability for coastal inundation from combined extreme waves, surges and river flooding events, that

can be sustained by the responsible national agencies. The first sub-project of CIFDP is being launched in Bangladesh where the most destructive coastal inundation regularly occurs due to storm surges and associated flooding.

Satellite observations have clearly demonstrated the potential to provide information to improve coastal inundation monitoring, forecasting and warnings; yet the quality and usability of these observations are still to be improved. This paper introduces the currently identified requirements for satellite information in support of the associated coastal applications, and proposes actions for CGMS Satellite Operators to participate in and contribute to the CIFDP implementation.

CNSA commented that it supported the objectives of the Coastal Inundation Forecasting Demonstration Project and stressed that detailed, consolidated studies of requirements were needed to identify and characterise the satellite datasets underpinning coastal inundation forecasts.

ESA drew attention to the ESA-funded eSurge project (http://www.storm-surge.info).

Action 39.37: CGMS Satellite Operators to consider the requirements of satellite information for coastal applications that are described in WMO-W-30, and provide comments to WMO (blee@wmo.int) Deadline: 31 December 2011

Action 39.38: CGMS members to liaise with WMO (blee@wmo.int) to coordinate training activities on forecasting and warning for storm surges and coastal inundation. Deadline: 31 December 2011

Recommendation 39.30: CGMS Members are encouraged to identify opportunities to develop and improve products and services contributing to CIFDP.

G.II/10 Other Parameters and Products

The paper **ROSH-WP-07** Applications of Meteorological Satellite Data for Environment Monitoring and Climate Researching ROSHYDROMET was presented as the opening paper of the WG II session and is referred to in more detail at the beginning of this report.

EUM-WP-23 reported on the availability of IASI Level-1 Product Extraction Software for Direct Readout. The paper provided short summary information on the availability of IASI Level-1 processing software for direct readout. A software package called OPS-LRS, which is based on the operational global IASI Level-1 processor software, developed by CNES and operated routinely by EUMETSAT in the Core Ground Segment (CGS), was modified and maintained for local processing by the EUMETSAT Satellite Application Facility on Numerical Weather Prediction (NWP SAF), hosted by the Met Office UK. Users can obtain the software in the framework of the AAPP package from the NWP-SAF via their web-page. A license agreement needs to be signed. The OPS-LRS software performs the processing from Level 0 data to Level 1c products. Since 2011, the software will be maintained by EUMETSAT in the Core Ground Segment. For that purpose, the software was made compatible with a Linux environment and is now identical to the operational global version. The distribution to Users will continue to be facilitated by the NWP SAF.

IMD-WP-05 reported on recent developments in predicting atmospheric instability with MODIS profiles using real time direct broadcast data over the Indian region. The National Satellite Meteorological Center (NSMC) of IMD has installed three real time direct broadcast ground receiving and processing systems. These systems currently receive Earth observation data from polar orbiting satellites, such as NOAA (National Oceanic and Atmospheric Administration) meteorological satellite series, METOP and the MODIS (Moderate Resolution Imaging Spectroradiometer) Terra and Aqua satellites for New Delhi, Chennai and Guwahati stations. The potential of MODIS temperature and moisture profile in assessing atmospheric instability using real-time direct broadcast data receiving stations installed at India Meteorological Department (IMD) is examined. MODIS temperature and moisture profile over the Indian region has been used to compute, a new index as MODIS profile instability (MPI), for clear and convective weather conditions during the period March to June 2011.The formulation of MPI and its comparison have been examined with well established traditionally used K index (KI), Lifted index (LI) and total totals (TT) index derived from radiosonde profiles of temperature, pressure and humidity. It has been observed that in most of the cases MPI has well correlated with those derived from ground truth observations. The results indicate that MPI can be used as a sensitive measure for the occurrence of extreme events such as thunderstorm and rainfall because no single stability index can provide a distinct threshold value for these events. The study suggests that the inclusion of MPI as a stability parameter in physical or statistical modelling can improve local severe storm predictions.

IMD-WP-24 presented recent advances in satellite applications for Tropical Cyclone monitoring and forecasting over the North Indian Ocean. A Tropical Cyclone (T.C) is one of the most devastating and deadly weather phenomena worldwide. Only about 5

T.C's (7% of global frequency) develop over the North Indian Ocean during a year including one over the Arabian sea and four over the Bay of Bengal, however, more than 75% of global T C causing loss of life of 5000 or more have occurred over the North Indian Ocean during the last 300 years. This high vulnerability is mainly due to the socio economic conditions, coastal bathymetry and the lack of observations from the cyclone field, which leads to under performance of cyclone prediction systems and hence poor early warning. Considering the above remotely sensed satellite data and products have been very helpful in recent years to improve the early warning system. In this document the recent advances in satellite data and products and their utility in T.C monitoring and forecasting over the North Indian Ocean have been presented and analysed. Visible and Infrared (IR) imageries from Kalpana –I are being used for estimation of centre and intensity of tropical cyclones. Nowadays Microwave and other imageries are also available from SSMI, SSMIS, Metop, TMI, AMSRE, WINDSAT, AMSUA, AMSUB satellites and accessed through a cyclone module in the forecasting workstation installed in India Meteorological Department have proved very useful in centre and intensity estimation of weaker tropical systems Scatterometer winds from Oceansat-II have also proved to be very useful for estimating the centre of systems. Apart from the better utilization of satellite data and products from various sources for operational purposes, the satellite data are also assimilated in global (G.F.S) and mesoscale models (W.R.F & H.W.R.F) improving the initial condition and forecast of the models. The satellite products are also used to estimate the adverse weather such as heavy rainfall (intensity & location), gale force winds (location & intensity) and storm surge through the estimation of radius of maximum wind based on maximum reflectivity. A review of past studies on all the above aspects are also presented and analysed in the document.

JMA-WP-07 presented the preparation for new products expected from follow-on satellites. The AHI imagers on board Himawari-8/9 (JMA's follow-on satellites to MTSAT-2) will have a higher level of observing capability than the MTSAT-2 imager. In association with this enhancement, JMA is improving its current satellite products (particularly those based on atmospheric motion vector data) as well as developing new products related to instability indices and volcanic ash. To support these developments, Himawari-8/9 simulated images are generated in two ways – one involving the accumulation of high-spectral-channel observations from hyper sounders such as AIRS and IASI, and the other using radiative transfer computation based on the provisional response functions of Himawari-8/9. WG II expressed interest in the simulation studies noting this being a necessary element of preparations for new satellite systems.

KMA-WP-07 reported on the current status of satellite data assimilation in the numerical weather prediction centre in KMA. KMA has been operating the UK Met Office Unified Model and data assimilation (4DVAR) system since May 2010. As COMS started to release its products in April 2011, KMA's NWP centre tested the model to use COMS atmospheric motion vectors (AMV) successfully. As of recently, the NWP model also uses other satellite data streams for assimilation. WG II applauded KMA for the successful update of its NWP model using assimilated satellite radiances, and for the demonstrated impact in forecasting skill.

KMA-WP-10 provided a summary of the current status of COMS products services. Currently, KMA is producing 16 meteorological parameters including cloud analysis, fog, Asian dust, atmospheric motion vector, and ocean variables from COMS raw data in support of various applications such as nowcasting, numerical weather prediction models, climate monitoring and so on. Among them, 10 COMS meteorological products are distributed to users and the others (e.g. land surface temperature, sea ice/snow cover) will be distributed by the end of this year. Validations of some products (e.g., aerosol index) with those produced by MODIS and OMI have been performed.

WG II welcomed the addition of a wide range of geostationary products from KMA COMS to the suite of products available to users. It encouraged KMA to make these products widely available for intercomparisons and use in weather, climate and oceanographic applications.

NOAA-WP-20 reported on progress towards using SSMIS to extend the SSMI total precipitable data record .The Special Sensor Microwave Imager/Sounder (SSMIS) aboard the Defence Microwave Satellite Program (DMSP) F16/F17/F18 satellites measures the Earth-emitted radiation at frequencies from 19 to 183 GHz. Compared to the Special Sensor Microwave Imager (SSM/I), SSMIS has similar imaging channels except for two at 85.5 GHz replaced by the 91.655 GHz frequency. After the calibration of SSMIS imager channels, the temperature data record (TDR) can be utilised operationally to derive both atmospheric and surface parameters. In this study, total precipitable water (TPW) is retrieved from SSMIS TDR using the SSM/I heritage algorithms by linear remapping of TDR from SSMIS to SSM/I imaging channels. TPW from F-15 SSM/I and F-16 SSMIS is inter-compared to quantify the mean bias and standard deviation. Both the relatively small mean bias and standard deviation indicate that the SSMIS total precipitable water may replace the SSM/I products for operational use.

Action 39.39: NOAA to report to SCOPE-CM on the progress of extending SSMI precipitable water

products with SSMIS. Deadline: Next SCOPE-CM meeting that will take place in August 2012 in Berlin. Deadline: 31 August 2012.

WMO-WP-22 summarised the outcome of the International Workshop on Satellite Analysis of Tropical Cyclones which was the first WMO International Workshop on Satellite Analysis of Tropical Cyclones (IWSATC) organised by the WMO Tropical Cyclone Programme, in collaboration with the WMO World Weather Research Programme and the World Data Center for Meteorology at NOAA/NCDC. The main purpose of the workshop was to increase the accuracy and reliability of satellite analyses of tropical cyclones (TCs) by sharing the latest knowledge and techniques amongst researchers and operational forecasters of the major warning centres. This included discussions on recent developments in satellite analysis of TCs, particularly the objective satellite-based TC analysis methods.

The workshop made a range of recommendations, including how operational centres in common TC basins can better achieve consistent TC estimates for real-time warnings (and among all TC basins for improved continuity in Best Tracks), and on how centres can optimally blend the emerging objective guidance methods with existing subjective methods.

NASA pointed out its significant contribution to tropical convection research by making all relevant datasets available to the science community. Upon request by NASA, WMO agreed to provide clarification on the linkage between the satellite-related activities of the WMO Tropical Cyclone Programme and the joint WWRP/THORPEX-WCRP Year of Tropical Convection (YOTC) project.

WMO-WP-23, prepared by GCOS, described the outcome of the GCOS Implementation Plan Satellite Supplement Updating. The draft up-date of the satellite-based component of the in 2010 updated "Implementation Plan for the Global Observing System for Climate in Support of the UNFCCC" provides supplemental detail related to the generation of global climate products derived from measurements made from satellites. A first analysis of the information which was provided to the draft satellite supplement is showing that the following Essential Climate Variables (ECVs) are addressed by a specific "agent for implementation", i.e., a CGMS working group or dedicated project or programme: Surface Wind, Precipitation, Upper-Air Temperature, Upper-Air Wind, Water Vapour, Cloud Properties, Aerosols, Fraction of Absorbed Photosynthetically Active Radiation (FAPAR), Leaf Area Index (LAI) and Fire Disturbance are covered by a specific "agent for implementation", i.e., a CGMS working group or dedicated project or programme. The ECVs Sea Ice, Sea Level, Sea Surface Temperature (SST), Sea State, Snow cover, Biomass, Soil moisture, Ice sheets, Lakes, Land cover, Earth Radiation Budget (ERB), Greenhouse Gases (GHGs), Ozone, Precursors are covered by CGMS in general, but the draft report did not specify a dedicated group. Further, CGMS is not addressing Sea Surface Salinity, Ocean Colour and Glaciers / Ice Caps.

While it was considered helpful to guide agencies in their coordinated response to GCOS needs, some discussion ensued on the correctness and completeness of the 'agents for implementation' of climate data records in support of satellite-based Essential Climate Variables (ECVs), as identified in Annex I of WMO-WP-23. The importance of active international expert groups tasked to investigate the issues related to climate data record generation for all satellite-based ECVs in a coordinated manner was emphasised.

Action 39.40: GCOS Secretariat to clarify the request formulated in the GCOS/WCRP letter (dated 12 May 2010) and to ask for an adequate response as further spelled out in WMO-WP-23. Rapporteurs of the four CGMS Working Groups (IROWG, IPWG, ITWG and IWWG) are requested to put this on the agenda of the upcoming meetings of the four Working Groups and to report back to CGMS40 and the GCOS Secretariat. Deadline: CGMS-40.

Action 39.41: CGMS requests the Rapporteurs to discuss, at the upcoming International Scientific Working Group meetings, the WG contributions to ECV production and reprocessing activities, and other relevant climate work. Deadline: CGMS-40.

The GCOS letter can be found at:

http://www.wmo.int/pages/prog/gcos/documents/GCOS-WCRP_JointLetter_All.pdf

G.II/11 Conclusion and Preparation of WG Report

WG II did, once again, cover a broad range of activities. Inter alia reports from all four scientific working groups under CGMS were discussed, which will all have their next meetings in 2012. WG II noted with pleasure the progress that has been made in many areas including instrument performance monitoring with emphasis on calibration. The good participation of NASA and their comprehensive contributions to earth-observations were acknowledged. A highlight was the start of the operational phase of the Korean COMS satellite and the delivery of operational products.

WG II also noted that the suggestion from CGMS38 WGII to address Climate Applications as a specific topic in WG II was not realised this time. It was agreed to consider a specific agenda item for CGMS40 under the proviso that a sufficient number of relevant papers get submitted to CGMS40. Therefore all CGMS members are encouraged to submit summary papers describing their ongoing activities on climate applications; the paper could also include current issues in the applications and the pertaining processing.

As closing remark the Chairman Prof. V. Asmus recalled that the 4th of October is a special date because on 4th of October 1957 the first Sputnik was launched.

Finally the Chairmen thanked all participants for good and focussed discussions. WG II returned the thanks to Prof. V. Asmus and Dr. V. Rao for their Chairmanship, and keeping the Working Group on schedule.

WORKING GROUP III: CONTINGENCY PLANNING

III/0 Introduction

Working Group III on Contingency Planning was convened on Monday 3 October 2011 at 14:00. As agreed at CGMS-39, Ms Suzanne Hilding (NOAA) and Mr Jérôme Lafeuille (WMO) served as Chairperson and Rapporteur respectively. The meeting was attended by participants from CMA, CNSA, EUMETSAT, JAXA, JMA, KMA, NASA, NOAA, ROSCOSMOS, ROSHYDROMET, WMO and GCOS, and from CSA as an Observer (see the list of participants in Annex 4).

The Chairperson indicated that after a review of actions from the previous session and an information document from NOAA on its polar-orbiting plans, the meeting would focus on global planning issues on the basis of four documents submitted by WMO and/or GCOS: Revision of the CGMS baseline for contributing to the GOS, Outcome of the GCOS/WMO workshop on continuity and architecture requirements for climate monitoring, Outcome of the GCOS Implementation Plan Satellite Supplement updating, and Gap analysis of satellite missions supporting the GOS.

III/1 Review of Actions from the Previous Meeting

At CGMS-38, the WG-III had generated seven actions, the status of which is summarised below:

WGIII 38.37	Action 38.37: WMO to report on the outcome of the Workshop on Continuity and Architecture Requirements for Climate Monitoring, at CGMS-39 (Due date: CGMS-39).	CLOSED by WMO-WP-24
WGIII 38.38	Action 38.38: CGMS satellite operators to report at CGMS-39 on their user-preparation activities for the next generation geostationary satellite series.	OPEN, pending reports to plenary under item C2
WGIII 38.39	Action 38.39: WMO with the support of the relevant Expert Teams, to prepare an update of the baseline for the space-based component of the Global Observing System along the lines of Annex 3 to the report of CGMS-38 WG III, and circulate to CGMS Members in advance of CGMS-39.	CLOSED by WMO-WP-02
WGIII 38.40	Action 38.40: WMO in collaboration with the atmospheric composition community and satellite experts to further refine the requirements for atmospheric composition requirements and the optimal way to address these in the revised baseline.	OPEN, ongoing, as reported in WMO-WP-09
WGIII 38.41	Action 38.41: CGMS Satellite Operators to confirm their commitments to contribute to the updated baseline for the space-based component of the Global Observing System (Due date: CGMS-39).	OPEN TO BE COMPLETED after report of this WG-III to the plenary
WGIII 38.42	Action 38.42: WMO to take into account the revised CGMS baseline for the space-based component of the GOS in the updating process of relevant WMO Manuals and Guides, with a view of its endorsement by CBS-XV in 2012.	OPEN Shall be based on the outcome of CGMS-39
WGIII 38.43	Action 38.43: CGMS Members to review the Draft Mapping of the gap analysis with the GCOS ECVs, and provide comments to WMO (Dr Bizzarro Bizzarri, bibizzar@tin.it) to be considered for a revised version to be submitted to the "Workshop on Continuity and Architecture Requirements for Climate Monitoring" on 13-14 January 2011. (Deadline: 15 December 2010.)	CLOSED in January, further update presented in WMO-WP-31

III/2 Continuity and Contingency Matters for Geostationary Satellite Missions

(with reference to the currently agreed baseline)

The WG was pleased to note that no continuity or contingency issues were raised for geostationary satellites.

III/3 Continuity and Contingency Matters for Polar-Orbiting Satellite Missions

(with reference to the currently agreed baseline)

NOAA-WP-25 provided updates on the POES and Joint Polar-orbiting Satellite System (JPSS), formerly NPOESS, data formats and frequencies. This table contained the latest information on the current and planned operations of the NOAA polar constellations.

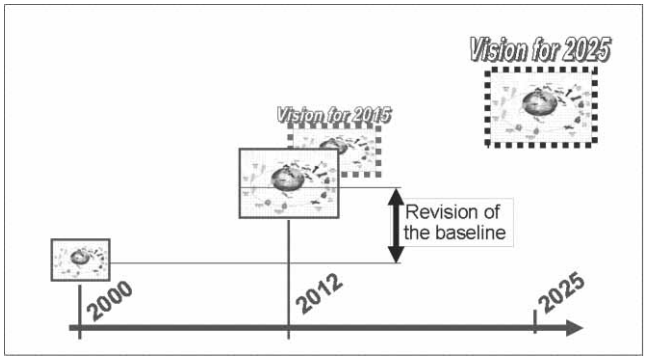
CGMS noted that NOAA-15, -16, -17 and-18 were at least partly functional well beyond their planned End of Life, NPP was slated for launch in October 2011 and JPSS-1 and -2 in 2016 and 2021, respectively.

The WG was pleased to note that no continuity or contingency issues were raised for polar-orbiting satellites in morning and afternoon orbits

III/4 Proposed Revision of the CGMS Baseline for Satellite Missions

WMO-WP-02 recalled that it had been agreed at CGMS-38 to proceed with an update of the CGMS baseline for GEO, LEO and HEO satellites within the space-based Global Observing System (GOS), as a proposed target-configuration for 2015, and Actions A38.39, A38.41, A38.42, and Recommendations R38.19, R38.20 had been agreed in this respect. In response to these actions and recommendations, the Expert Team on Satellite Systems (ET-SAT) reviewed the issue in detail and proposed an updated baseline as contained in the Appendix to WMO-WP-02, while clarifying the scope of this exercise as follows:

- The baseline focuses only on the missions to be undertaken on an operational or sustained basis, which implies that long-term continuity is planned.
- As advised by CGMS-38, the baseline describes the missions committed as a whole by CGMS members, without explicit mention of which member is taking responsibility for which mission(s).
- The details of the individual contributions of agencies are however described in an annex, in order to ensure traceability between the baseline and agencies' plans, to give confidence that the baseline can be implemented.
- The baseline and its annex take into account the missions available, firmly planned (with approved funding) at the time of adoption by CGMS and expected to be continued.
- For describing the baseline, it was decided to categorize space-based missions first by orbit types (GEO, LEO sun-synchronous, other LEO, and ultimately HEO).
- The baseline should, however, not be limited to listing space-based missions, but should also encompass a commitment for data availability and dissemination, as well as inter-calibration and contingency planning.



The proposed new CGMS baseline is a major enhancement of the previous baseline, and represents already significant progress towards the full implementation of the Vision of the GOS in 2025. It reflects not only advances in technology to support meteorological missions but also the expanding scope of missions assumed by CGMS members in particular, in support of climate and environmental monitoring.

The GCOS Secretariat commended the initiative to develop such a revised baseline, which seeks to secure long-term continuity of key climate observations. It encouraged satellite operators to agree on such an approach, which would allow developing firm plans and managing contingencies.

The WG-III suggested three amendments to the proposal:

- As concerns data dissemination, it was stressed that appropriate frequency bands should be preserved for Direct Broadcast and other dissemination means to secure all-weather data transmission.
- Direct Broadcast protocols should be harmonized among the core missions on sun-synchronous orbits, in order to enable users to receive the data from these different missions with broadly similar receiving infrastructure.
- Under contingency planning, it should be stated that in case of potential gaps on core sun-synchronous missions, absolute priority should be given to observation from mid-morning and early afternoon orbits, in order to maintain the continuity of these datasets.

The discussion in WG-III highlighted that focusing on missions that are decided and managed in an operational or sustained framework, with a perspective of long-term follow-on, in no way precludes the importance of other missions undertaken e.g. on a research or demonstration basis. First of all, it is well understood that current research and development are the foundation of tomorrow's operational missions. Furthermore, as explained by NASA, R & D agencies normally don't commit to sustain any mission for decades ahead; experience shows, however, that many missions initiated in an R & D framework happen to be extended well beyond their design life time and end up in providing longstanding support to both scientific and operational activities.

It was clarified that even in the operational framework no agency has a formal guarantee of funding beyond (in the best case) the lifetime of a programme. There is, however, a general expectation that operational missions will have follow-on, as long as their need is confirmed and their implementation affordable.

With this understanding, the satellite operators were invited to express whether they would support the proposed baseline.

- ROSHYDROMET supported the baseline, after providing a detailed update of the dates of implementation of Meteor-M2, Meteor-M3, and Elektro-M.
- EUMETSAT supported the baseline, noting that its ability to implement its contribution would depend on approval by its Council.
- NOAA supported the baseline, on the basis of current budgetary assumptions.
- JMA supported the baseline, noting that the forthcoming Himawari generation planned as of 2015 would not include all the functionalities listed in the baseline.
- KMA supported the baseline, noting that some of the functionalities required in geostationary orbit would only be available with COMS-2.
- CMA supported the baseline, confirming its intention to maintain two geostationary locations and sun-synchronous morning and afternoon series; CMA further indicated a possibility to consider a mission in early morning orbit, if necessary, instead of the mid-morning mission in order to optimize the global constellation.

Recommendation 39.31: WGIII recommended that the baseline be submitted to and endorsed by the plenary with the amendments and clarifications brought by the session, as included in Annex 1 to the WG-III report.

It was noted that even if some of the planned programmes did not meet all the required capabilities, these programmes could complement each other and –altogether- would implement the proposed baseline. The status of these plans is summarised in Annex 2. It was also noted that the proposed baseline did not include Highly Elliptical Orbit (HEO) missions for the time being, as these missions were still currently at the stage of demonstrating their operational value.

WMO thanked the satellite operators for their support and underlined that the adoption of this revised baseline would be a major foundation for the operational/ sustained component of the physical architecture for climate monitoring from space.

WMO-WP-24, in response to Action 38.37, WMO reported the outcome of the workshop on "Continuity and Architecture Requirements for Climate Monitoring," which was organised in Geneva by WMO and GCOS from 13 to 14 January 2011.

The workshop had commented on the Gap Analysis with respect to ECVs, and noted a risk of gaps in several areas. For instance, for Earth Radiation Budget, it recommended agencies to urgently consider planning for continuous availability of at least one broad-band radiometer and one Total Solar Irradiance instrument as of 2020, and also encouraged scientific cooperation to support such ERB missions. As another example, it expressed concern about the lack of planned follow-on to the Global Precipitation Measurement (GPM) precipitation radar mission noting its expected benefit for climate, weather and hydrology applications.

From a more general perspective, the workshop:

- Suggested more consideration be given to climate instruments (such as limb sounders) on board future operational missions;
- Highlighted that the process to identify needs and priorities based on a systematic Gap Analysis was a critical step in the definition of an architecture;
- Furthermore, suggested increasing communication and coordination among the CGMS-sponsored international scientific working groups (IPWG, IROWG, ITWG, IWWG) and the CEOS Virtual Constellations;
- Recommended continuity of high-accuracy and stable reference instruments as anchors to increase the value of operational instruments for climate purposes, and wished that GSICS, in consultation with WGCV, explore mechanisms to implement this approach.

In addition, the workshop discussed the overall approach for an architecture for climate monitoring from space and established a writing team to work out a concept paper on this topic, which is the subject of **WMO-WP-08**.

Recommendation 39.32: R & D or operational satellite operators should consider the provision of some high-accuracy and stable reference instruments as anchors for operational instruments, in particular, for climate purposes.

III/5 Continuity of Operational Oceanographic Satellite Missions and the Missions Supporting Climate Monitoring

In **WMO-WP-23** GCOS summarised the outcome of the GCOS Implementation Plan Satellite Supplement updating process. The draft up-date of the satellite-based component of the in 2010 updated "Implementation Plan for the Global Observing System for Climate in Support of the UNFCCC" provides supplemental detail related to the generation of global climate products derived from measurements made from satellites. A first analysis of the information which was provided to the draft satellite supplement is showing that:

- Surface Wind, Precipitation, Upper-Air Temperature,

Upper-Air Wind, WaterVapour, Cloud Properties, Aerosols, Fraction of Absorbed Photosynthetically Active Radiation (FAPAR), Leaf Area Index (LAI) and Fire Disturbance are covered by a specific "agent for implementation", i.e., a CGMS working group or dedicated project or programme;
- Sea Ice, Sea Level, Sea Surface Temperature (SST), Sea State, Snow cover, Biomass, Soil moisture, Ice sheets, Lakes, Land cover, Earth Radiation Budget (ERB), Greenhouse Gases (GHGs), Ozone Precursors are covered by CGMS in general, but the draft report did not specify a dedicated group;
- Furthermore, CGMS is not addressing Sea Surface Salinity, Ocean Colour and Glaciers / Ice Caps.

It was confirmed that while the missions implemented by CGMS satellite operators and coordinated by CGMS were supporting a range of ECVs, the corresponding product generation was not systematically coordinated within CGMS. Satellite product derivation methods are addressed in CGMS Working Group-II, the range of topics addressed by this WG is evolving, though this does not necessarily imply that WG-II is an appropriate forum to coordinate the implementation of all ECV products. CGMS members were invited to review the tentative mapping of CGMS activities and related groups against GCOS ECVs, as contained in Annex 1 of CGMS-39 WMO-WP-23. The table also included the CGMS sponsored international science groups (ITWG, IPWG, IWWG, IROWG), SCOPE-CM and GSICS. WMO urged CGMS to respond to the GCOS call for implementation of ECV generation. It noted that ultimately the "Architecture for climate monitoring from space" should provide a mechanism to ensure that such needs are systematically addressed.

CGMS WG-III was invited to review the tentative mapping of CGMS activities and related groups against GCOS ECVs, as contained in Annex 1 of CGMS-39 WMO-WP-23. Noting that this topic was also submitted to WG-II, the action was deferred to WG-II.

WMO-WP-31 first described the methodology used in Vol. 3 of the WMO Dossier on the Space-based Global Observing System (GOS Dossier) containing the "Gap analysis in the space-based component of GOS", which analyzes the plans related to 33 categories of missions from 2008 to 2025, and evaluates risk of gaps in the post-2020 timeframe for each of these missions.

Based on this general analysis, the document highlights critical areas from two perspectives: (i) for operational missions foreseen in the Vision of the GOS in 2025, and (ii) more specifically for the GCOS ECVs.

With respect to the Vision, the following gaps are identified:

- For infrared and microwave sounding on the early morning orbit;
- For hyperspectral sounding on some geostationary sectors;
- There is a risk of insufficient coverage by radio-occultation missions in the short-term and in the long term;
- Lack of long-term plan for spaceborne precipitation radar after the Global Precipitation Measurement (GPM) mission;
- And lack of long-term commitment on Earth Radiation Budget.

With respect to the GCOS ECVs, the analysis was performed over 50 years (1975-2025). The study suggests that 40 out of the 60 "elementary" ECVs can be supported by satellite observation. For many observations, data records exist since at least 1975, and there is a long-term commitment to continuity until at least 2025. The potential contribution of satellites to monitoring the ECVs is extensive, however, it has to be stressed that the contribution of observational data sets is only effective when the corresponding product has been retrieved and archived. The analysis of observation assets and plans underscores the same critical situation for Earth Radiation Budget, radio-occultation and for spaceborne precipitation radars. In addition, the analysis highlights:

- an anticipated gap in the measurement of stratospheric ozone, long life greenhouse gases and ozone precursors due to the lack of future limb sounding missions,
- the need to develop plans for Lidar missions for the measurement of aerosols and sea-ice,
- and for low-frequency MW follow-on missions for salinity and soil moisture.

CGMS Satellite Operators were invited to note the results of the gap analysis of satellite data for the GOS, and more specifically, for climate monitoring, and to consider actions to address these anticipated or potential gaps. The WG welcomed the analysis and thanked its author, Dr B. Bizzarri. It was clarified that some gaps were due to the current lack of an appropriate technology, others to funding limitations. GCOS expressed its appreciation for the analysis and indicated that it would be submitted as input to the GCOS science groups, to be taken into consideration in the regular assessment cycles.

Recommendation 39.33: CGMS Satellite Operators to address the anticipated or potential gaps identified in the WMO Gap Analysis, in particular:

- **infrared and microwave sounding on the early morning orbit,**

- **hyperspectral sounding missing in some geostationary sectors,**
- **long-term follow-on of radio-occultation constellation,**
- **global precipitation measurement precipitation radar follow-on mission,**
- **long-term Earth Radiation Budget monitoring**
- **limb sounding for high-vertical resolution observations in the stratosphere and mesophere (of temperature, humidity, wind, aerosol, ozone, and other trace gases).**

III/6 Conclusion and Preparation of WG Report

The Chairperson thanked the participants for their contributions and the meeting was closed at 16:45 on Monday 3 October 2011.

ANNEX 1 of WG III:

PROPOSED CGMS BASELINE FOR THE OPERATIONAL CONTRIBUTION TO THE GOS

Future satellite missions to be performed on operational/sustained basis

Introduction

In support of the programmes coordinated or co-sponsored by WMO for weather and climate, CGMS Members plan to maintain the operational capabilities and services described below, that constitute the "CGMS baseline for the operational contribution to the GOS".

While the subject of this particular document is deliberately limited to missions that are decided and managed in an operational or sustained framework, with a perspective of long-term follow-on, this in no way precludes the importance of other missions undertaken e.g. on a research or demonstration basis. First of all, because today's research and development are the foundation of tomorrow's operational missions. Furthermore, because many missions initiated in an R & D framework for a limited duration are eventually extended well beyond their design life time and provide longstanding support to both scientific and operational activities.

The baseline takes into account the current satellite missions and the firmly planned satellite programmes as of 2011.

This baseline comprises a constellation of geostationary satellites, core meteorological missions and other missions in sun-synchronous orbits, missions in non-sun synchronous Low Earth Orbit, contingency planning, as well as provisions for satellite instrument inter-calibration, data dissemination and stewardship.

I. Constellation in geostationary orbit

At least six geostationary satellites shall be operated at evenly distributed locations with in orbit redundancy, and perform the following missions:

a. Advanced visible and infrared imagery (at least 16 spectral channels, 2km resolution) over the full disc at least every 15 minutes
b. Infrared sounding (hyperspectral on some positions)
c. Lightning detection
d. Data collection
e. Space environment monitoring

On selected positions, the following missions shall be performed:

f. Earth Radiation Budget monitoring
g. High spectral resolution UV sounding
h. Solar activity monitoring

II. LEO sun-synchronous missions

Operational sun-synchronous satellites shall be operated around three orbital planes in mid-morning ("am", nominally 09:30 descending, 21:30 ascending ECT), afternoon ("pm", nominally 13:30 ascending ECT) and early morning (nominally 05:30 descending, 17:30 ascending ECT) and, as a constellation, shall perform the following missions:

1) Core meteorological missions nominally on 3 orbital planes

i. Multispectral visible and infrared imagery
j. Infrared hyperspectral sounding (at least am and pm)
k. Microwave sounding

l. Microwave imagery

2) Other missions on sun-synchronous orbits

m. Wind scatterometry over sea surfaces (at least two orbital planes)
n. Ocean surface topography by radar altimetry (at least on am and pm orbits, supplemented by a reference mission on a high-precision, inclined orbit)
o. Radio-occultation sounding (at least am and pm, supplemented by a constellation in specific orbits)
p. Broadband VIS/IR radiometer for Earth Radiation balance (at least am and pm)
q. Total Solar Irradiance (at least one)
r. Contribution to atmospheric composition observations (at least am and pm)
s. Narrow-band Vis/NIR imagers (at least one sun-synchronous, am spacecraft) for ocean colour, vegetation and aerosol monitoring
t. High-resolution multi-spectral Vis/IR imagers (constellation of sun-synchronous satellites, preferably in am)
u. IR dual-angle view imagery for high-accuracy SST (at least one am spacecraft)
v. Particle detection and / or electron density (at least am and pm)
w. Magnetic field (at least am and pm)
x. Solar activity (at least two)
y. Data collection

III. Other LEO missions

The following missions shall be performed on an operational basis by Low Earth Orbit satellites on appropriate orbits:

z. Ocean surface topography by radar altimetry (A reference mission on high-precision, inclined orbit, complementing two instruments on sun-synchronous am and pm orbit)
aa. Radio-Occultation sounding (dedicated constellation of sensors on appropriate orbits)

IV. Contingency Planning

The CGMS baseline is associated with contingency plans for geostationary and polar-orbiting satellite systems, which are detailed in the CGMS Global Contingency Plan[1].

V. Inter-calibration

Instruments should be inter-calibrated on a routine basis against reference instruments or calibration sites. The routine and operational intercalibration and corrections shall be performed in accordance with standards as agreed by the Global Space-based Inter-calibration System (GSICS).

VI. Data availability and dissemination

VI.1. Data open availability with suitable timeliness

All operational environmental observation satellite systems should be designed to ensure the provision of data with suitable timeliness, as appropriate for their intended applications. Data should be preserved for the long term and documented with metadata allowing their interpretation and utilization. The satellite operators should establish dissemination contents and schedules that take into account the data requirements of users. Re-broadcast via telecommunication satellites should complement and supplement direct broadcast services, which allows cost-efficient access to integrated data streams including data from different satellites, non-satellite data and geophysical products. The dissemination systems should utilize all-weather resilient telecommunication means.

VI.2. Direct broadcast for core meteorological missions in LEO

The core meteorological satellite systems in LEO orbits, and other operational observation satellite systems when relevant, should ensure near-real-time data dissemination of imagery, sounding, and other real-time data of interest to Members by direct broadcast. Direct broadcast frequencies, modulations, and formats for polar-orbiting satellites should allow a particular user to acquire data from either satellite by a single antenna and signal processing hardware. Direct Broadcast should use allocations in all-weather resilient frequency bands.

VII. Note

The present update of the CGMS baseline is based on an assessment of currently (2011) operated or firmly planned satellite missions.

1 The Global Contingency Plan (http://www.wmo.int/pages/prog/sat/documents/CGMS_Global-Contingency-Plan_version2_070507.pdf) should be updated accordingly. It should indicate that in case of potential gaps on core sun-synchronous missions, absolute priority should be given to observation from mid-morning and early afternoon orbits, in order to maintain the continuity of these datasets.

I. Constellation in geostationary orbit

Missions	Qualifications	135W	75W	0	76E	86.5	93.5E	105E	128E	140E
VIS IR imagery	At least 6 positions	NOAA	NOAA	EUMETSAT	ROSHYDROMET	China	IMD	CMA	KMA	JMA
Advanced VIS/IR imagery (2km resol or better, at least 16 channels, 15min or better)	2 positions 2015 3 positions 2016 8 positions 2017	NOAA (as of 2017)	NOAA (as of 2020)	EUMETSAT (as of 2017)	ROSHYDROMET (as of 2018)	CMA (as of 2017)		CMA (as of 2015)	KMA (as of 2017)	JMA (as of 2015)
IR Sounding	3 positions until 2018	NOAA (until 2018) mitigation	NOAA (until 2019) mitigation				IMD			
IR hyperspectral Sounding	1 position 2015, 2 position 2017 3 positions 2018			EUMETSAT (as of 2019)	ROSHYDROMET (as of 2018)	CMA (as of 2017)		CMA (as of 2015)		
Lightning detection	2 pos. 2015 3 pos. 2016 6 pos. 2017	NOAA (as of 2017)	NOAA (as of 2020)	EUMETSAT (as of 2017)	ROSHYDROMET (as of 2018)	CMA (as of 2017)		CMA (as of 2015)		
Data collection	At least 6 positions	NOAA	NOAA	EUMETSAT	ROSHYDROMET	CMA	IMD	CMA	KMA	JMA
Space Weather Monitoring	3 pos. 2015 4 pos. 2016 6 pos. 2017	NOAA	NOAA		ROSHYDROMET	CMA (as of 2017)		CMA (as of 2015)	KMA (as of 2017)	JMA (as of 2015, housekeeping purpose)
Earth radiation budget	1 position 2 position 2016			EUMETSAT (until 2020)	ROSHYDROMET (as of 2018)					
High spectral resolution UV sounding	1 position 2018			EUMETSAT (as of 2018)						
Solar activity	1 position 2015 2 positions 2016 5 positions 2017	NOAA	NOAA		ROSHYDROMET (as of 2018)			CMA (as of 2017)	KMA (as of 2017)	

II LEO Sun-Synchronous Missions

II.1 Core meteorological missions required on 3 sun-synchronous orbital planes (AM, PM, EM), with direct broadcast

Missions	**Planned Orbital Configuration** (Missions marked with a star are operated in a "sustained" mode by R & D agencies)		
	Mid-morning (AM)	**Afternoon (PM)**	**Early morning (EM)**
Multispectral VIS/IR imagery	EUMETSAT CMA ROSHYDROMET (as of 2013)	NOAA/NASA, then NOAA CMA	DOD
IR hyper-spectral sounders	EUMETSAT CMA (as of 2016) ROSHYDROMET (as of 2013)	NOAA/NASA, then NOAA CMA (2014)	
MW sounders	EUMETSAT CMA ROSHYDROMET (as of 2013)	NOAA/NASA, then NOAA CMA	DOD
MW imagers – some polarimetric	CMA ROSHYDROMET (as of 2015)	CMA JAXA (*) (no direct broadcast)	DOD

II.2 Other Operational/Sustained Missions on various orbits

Missions	Planned Orbital Configuration (Missions marked with a star are operated in a "sustained" mode by R & D agencies)			
	Sun-synchronous Morning	Sun-synchronous Afternoon	Other sun-synchronous	Non sun-synchronous
Scatterometers (At least 2 on well separated orbital planes)	EUMETSAT ROSHYDROMET (2016)		ISRO(*) ECT=12:00	
Altimeter constellation	EU/ESA/EUMETSAT (as of 2014)		ISRO(*) ECT=12:00	EUMETSAT/CNES/ NOAA/NASA (Precision, inclined orbit)
Radio occultation (At least 8 receivers)	EUMETSAT CMA (2016) ROSHYDROMET (as of 2015)	CMA (as of 2014)	ISRO(*) ECT=12:00	NOAA
Broad-band Vis/IR radiometer	CMA	NOAA/NASA, then NOAA		
Total solar irradiance sensor	CMA	NOAA (as of 2016)		
Atmospheric composition (Contribution to)	CMA EUMETSAT ROSHYDROMET (as of 2015)	NOAA/NASA, then NOAA CMA		
Narrow-band Vis/NIR imagers (for ocean colour and vegetation)	EU/ESA/EUMETSAT (as of 2014) ROSHYDROMET (as of 2015)	NOAA/NASA, then NOAA		
High-resolution multi-spectral Vis/IR imagers (Land surface imaging constellation)	NASA/USGS INPE/ CNSA (*) EU/ESA (as of 2014) (*)			
IR dual-angle view imager(for high accuracy SST)	EU/ESA/EUMETSAT (as of 2014)			
Particle detection (Electrons, protons, neutrons, etc) and/or electron density	CMA EUMETSAT ROSHYDROMET (as of 2013)	CMA	DOD (early morning)	
Solar monitoring	CMA	CMA		
Magnetic field	CMA	CMA	DOD (early morning)	
Data Collection System	EUMETSAT ROSHYDROMET (2013)	NOAA		

WORKING GROUP IV: GLOBAL DATA DISSEMINATION

IV/0 Introduction

As agreed at CGMS-39, Mr Mikael Rattenborg from EUMETSAT was elected Chairperson of Working Group IV (WG IV) on Global Data Dissemination, with Mr Gordon Bridge, also from EUMETSAT, appointed as Rapporteur. WG IV comprised representatives of the following satellite operators: CMA, EUMETSAT, JAXA, JMA, KMA, NASA, NOAA, ROSCOSMOS, ROSHYDROMET and WMO. There were also representatives from CSA (Canada) and Environment Canada.

IV/1 Review of Actions from the Previous Meetings

CGMS-37

Action 37.37: All CGMS satellite operators to regularly include user statistics in their reports on current satellite systems. Deadline: CGMS-39

Status: **Closed.** This is now permanent action 06.

CGMS-38

Action 38.44: NOAA to provide a report to CGMS on its planning for the transition of users from the current GOES system to GOES-R. Deadline CGMS 39

Status: **Closed**. Discussed in **IV/2**.

Action 38.45: EUMETSAT to provide CGMS with more detailed information and the schedule of implementation for the various MTG data dissemination schemes. Deadline CGMS39.

Status: **Closed**. Discussed in **IV/2**.

Action 38.46: CGMS satellite operators to inform CGMS on progress towards the achievement of broadcast services (physical layers, formats, etc.) in the timeframe of the EPS-SG and JPSS satellites. Deadline CGMS 39.future

Status: **Closed**. Discussed in **IV/2**.

Action 38.47: NOAA and EUMETSAT to present a description of joint broadcast services for EPS-SG and JPSS. Deadline: CGMS 39.

Status: **Closed**. Discussed in **IV/2**.

Action 38.48: CGMS satellite operators to inform CGMS on efforts to widen user access and to establish and respond to user requirements with GEONETCast. Deadline: CGMS 39.

Status: **Closed**. Discussed in **IV/3**.

Action 38.49: CGMS members to report on their measures and plans regarding interoperability and standardised online data access for archived data-sets. Deadline: CGMS-39.

Status: **Closed**. Discussed in **IV/5** and **IV/6**.

Action 38.50 CGMS members are invited to report on the current measures taken in their Organisation for the long-term preservation of data and indicate if a future harmonised approach (e.g. common guidelines) would be helpful. Deadline: CGMS-39.

Status: **Closed**. Discussed in **IV/5**.

Action 38.51: CGMS Members to verify if they have been registered as a part of WIS, in particular as Data Collection or Production Centres (DCPCs) or National Centres (NCs).

Status: **Closed**. Discussed in **IV/6**. IMD to clarify its position.

Action 38.52: Candidate DCPCs or NCs to review the WIS specifications to ensure they are able to support the relevant WIS interfaces, including ensuring metadata describing their products and services is available in WMO format (ISO19115) for uploading to a Global Information System Centre (GISC).

Status: **Closed**. Discussed in IV/6.

Action 38.53: IMD and KMA are invited to nominate experts to the WMO/CGMS Task Force on Satellite Data Codes. Deadline: end January 2011.

Status: Closed for KMA. IMD to clarify its position.

IV/2 Direct Readout and Direct Dissemination

CMA-WP-16 informed CGMS that NSMC/CMA has released two software packages, FY3L0pp V1.0 and FY3L1pp V1.0, to help FY-3A/B Direct Broadcast users processing X-band MPT data (MERSI instrument) and L-band HRPT data (all instruments but MERSI), which are packed into CCSDS format. At present, the two software packages are capable of processing raw

data from the following four instruments onboard the FY-3A/B: MERSI, VIRR, MWTS and MWHS. Users can obtain the package and ancillary data (in English language) by sending a request to CMA for approval (Fax: +86-10-62172727).

Through the Chairman, CGMS expressed strong interest in the processing software packages and expressed appreciation for their release.

In response to Action 38.45, **EUM-WP-34** presented the planned evolution of the EUMETSAT multi-mission dissemination system to accommodate future high data volume demand of MTG and other services. The upgrade of EUMETCast Europe to the DVB-S2 standard will provide the flexibility to add the MTG near real time data in a cost efficient way to the satellite dissemination. This will make MTG data available to all users in the EUMETCast Europe footprint. A subset of these products will be available to users in the EUMETCast Africa footprint. RMDCN is still the appropriate network for operational dissemination of WMO coordinated data for global exchange. A high rate terrestrial dissemination path using DANTE research networks is also being explored.

A preliminary MTG dissemination baseline was also presented in the document. Updates to the baseline will be published in future papers as they become available.

NOAA-WP-30 provided the status of the Low Rate Information Transmission (LRIT) on the GOES I-M and NP spacecraft. The LRIT broadcast is operational on both the GOES-east and GOES-west spacecrafts. NOAA is also in design stage of the HRIT/EMWIN broadcast service for the GOES-R Series of spacecraft.

Our short range plans include the expansion of the product suite and completion of the back-up LRIT system at the Continuity of Operations site in Wallops, Virginia.

NOAA will also continue it outreach efforts with an increased focus on the upcoming HRIT/EMWIN system for GOES-R series of satellites that includes briefings and live demonstrations of a prototype receiver system that is compatible with all current and planned GOES LRIT broadcasts.

JMA expressed appreciation for the cooperation and arrangements being made with NOAA. CGMS noted the L-band broadcast changes that would take place with GOES-R that would impact the wider user community. NOAA confirmed that it was already looking at means to lessen the impact on various user groups.

NOAA-WP-27 presented information on the direct readout services from the NPP and JPSS satellites. High Rate Data (HRD) and Low Rate Data (LRD) are both direct broadcast services provide by NOAA, the data is freely available to international users as long as they have the proper receiving equipment. The HRD service will be available on NPP and JPSS satellites; however, currently JPSS-1 will only have HRD and would only have LRD contingent upon budget.

NOAA confirmed that JPSS-2 will have both LRD and HRD, adding that the data content of LRD will be driven by NPOESS requirements. The inclusion of Level 1 data in LRD is not foreseen. The Chairman commented that there would be significant interest in having sounding data included in this broadcast.

Action 39.42: NOAA to provide more information on the content of LRD broadcasts in due course. Deadline: CGMS-40.

EUM-WP-35 informed CGMS that EUMETSAT is defining the EPS Second Generation (EPS-SG) satellite system which is planned to be operational by end of this decade and provide observations in the mid morning orbit as part of the Joint Polar System (JPS) set-up in coordination with NOAA. Instrument observation data will be broadcast directly by the satellites in real time. The paper addresses the status of the plans of the broadcast service for EPS-SG, and the transition from the current service.

NOAA-WP-33 presented a summary of the direct readout plans for future NOAA environmental spacecraft. The transition of the NOAA direct readout services is taking place across several spacecraft constellations. This will encompass many years of development, coordination and implementation. In 2005, replacement of the analogue Weather Facsimile (WEFAX) with the new digital LRIT started a transition period that will culminate with the implementation of the High Rate Information Transmission/Emergency Managers Weather Information Network (HRIT/EMWIN) service combined with the transition from today's GOES Variable (GVAR) retransmission format to the GOES Re-Broadcast (GRB) service on the GOES-R spacecraft constellation. NOAA's current direct broadcast services will change dramatically in data rate, data content, and frequency allocation, and driving changes to the field terminal configurations. The geostationary and polar-orbiting environmental satellite constellations will employ higher data rates, larger bandwidths, and new downlink frequency allocations. Environmental data users must employ new field terminal receivers unique to each particular broadcast service.

Concerning the evolution of LRIT, NOAA confirmed its continuation up to the time of routine operations of

GOES-R, and EUMETSAT confirmed that its future MSG-3 and 4 satellites would also continue to have LRIT broadcasts. Both agencies agreed to continue reporting on the evolution of LRIT at future CGMS meetings.

What was of more concern to CGMS was the situation regarding the next generation EUMETSAT and NOAA LEO satellite low rate broadcasts which were still in definition and following somewhat different design paths which could, as a consequence, significantly impact future user reception station design (and cost).

However, there appeared to be general commonality within CGMS (EUMETSAT, CMA and NOAA) in the design of future (X-band) high rate broadcasts. The following actions were agreed:

Action 39.43: EUMETSAT and NOAA to prepare a new global specification for LEO high rate broadcast services and present it for consideration at the next meeting of CGMS. Deadline: CGMS-40.

Action 39.44: CMA to nominate a Point of Contact to follow the evolution of the new global specification for LEO high rate broadcast services and to comment accordingly at CGMS 40. Deadline: CGMS-40.

Concerning LEO low rate services, CGMS noted that CMA intended to continue such a service on its satellites until the 2020 timeframe, EUMETSAT did not have such a committment coming from its European user base and NOAA remained commited in the longer term.

The Chairman commented that that it might be an approriate time to reassess the global need for the low rate broadcast service in the longer term. Noting the comments by EUMETSAT relating to the European user base requirements, WMO highlighted the global nature of the LEO user community. Since the current CGMS standard for LEO Direct Broadcast is implemented worldwide in L-Band, which is an all-weather frequency band, and is allocated by the ITU to Meteorological Satellites (though on a shared basis), there is globally an expectation that at least a low data rate will continue in L-Band. Whilst ackowledging the need for technological evolution, WMO considered that before giving up such a worldwide established practice, it would be appropriate to carry out a consultation of the global user community on the long term need for this service. To this end it would be helpful if EUMETSAT could keep the option open until the results of the consulation have been analysed. The Chairman added that the content of the L-band broadcast needed clear definition as there would be bandwidth constraints which could vary depending upon the satellite system. EUMETSAT advised CGMS that it would very soon start the EPS-SG Phase B development activities (duration 2012 – 2014) so it was important that any revision of the current broadcast baseline, if agreed, occured as soon as possible. Hence, a recommendation from CGMS relating to L-band broadcasts from LEO satellites was needed by the beginning of 2013 at the latest.

The following action was agreed:

Action 39.45: WMO to consult WMO Members on the requirement for a "Low Data Rate" service in L-Band on future generation polar-orbiting systems, and on the expected contents of such a service. Deadline: CGMS-40.

Action 39.46: EUMETSAT to re-assess the European user requirement for a L-band service from its LEO satellites, bearing in mind the ongoing broader consultation process of WMO, and report to CGMS accordingly. Deadline: CGMS-40.

WMO-WP-25 proposed an amendment to the CGMS HRIT/LRIT Global Specification (CGMS 03) with effect to align the geographical reference system of the normalized geostationary projection with the internationally agreed standards World Geodetic System 1984 (WGS84) and Earth Geodetic Model (EGM-96) as recommended by the WMO Commission for Basic Systems. It was emphasized that the current discrepancy between the HRIT/LRIT Global Specification and these international standards is a potential source of confusion and generates a risk of positioning errors when merging data with e.g. GPS-based sources, or Geographic Information System (GIS) applications, or when exchanging data with these communities. The space agency representatives participating in the sixth meeting of the Expert Team on Satellite Systems (ET-SAT-6) thus unanimously agreed that CGMS should be requested to update its HRIT/LRIT Global Specification. The amendment would affect three parameters in Section 4.4.3.1 (Geographical coordinates) and Section 4.4.3.2 (Normalized geostationary projection): the reference meridian, the equator radius and the polar radius, as well as four numerical coefficients derived from these parameters.

CGMS agreed to adopt the now commonly recognised geographical reference systems. EUMETSAT commented that the impact of implementing such changes was very small in terms of changed latitude and longitude coordinates when retrieving archived data. Furthermore, in LRIT broadcasts, information on the shape of the Earth was not included.

The following Action and Recommendation from the WMO WP were agreed:

Action 39.47: The CGMS Secretariat to prepare an amendment of the CGMS HRIT/LRIT Global Specification (CGMS 03) with effect to adopt the geographical reference system of the World Geodetic System (WGS84) and Earth Geodetic Model (EGM-96) as described in CGMS-39 WMO-WP-25. Deadline: CGMS-40.

Recommendation 39.34: CGMS satellite operators to adopt the World Geodetic System (WGS84) and Earth Geodetic Model (EGM-96) geographical reference systems for the normalised geostationary projections in all future geostationary systems and related products, and inform the users accordingly.

IV/3 DVB-Based Dissemination Services

CMA-WP-18, prepared in response to Action 38.48, informed CGMS that CMACast is ready for full operation at the end of 2011. Effort to upgrade the user equipment to transfer from the FENGYUNCast, PCVSAT and DVB-S to the CMACast is undergoing. CMA donated CMACast terminals to 16 developing countries and provided technical training on a regional WIS training seminar in Beijing this year. Metadata for CMACast data has been published on CMA WIS portal for user access. CMACast - EUMCast data exchange and re-dissemination has been established, and interoperation platform has been set up to apply data policies and to remove language barriers for global interoperability.

CMA added that it had the intension to widen the availability of the broadcast to all developing countries in the Asia-Pacfic region and would increase the current data exchange with GEONETCast and EUMETCast.

WMO suggested that it would be helpful if CMA was to produce a CMACast fact sheet for the growing user community in the Asia Pacific region and nominate a point of contact to address user enquiries. WMO added that it would be very happy to redistribute the fact sheet to potential users. CMA remarked that this would be done. However, commercial issues and technical support for CMACast user stations also need to be considered.

The following action was agreed:

Action 39.48: CMA to prepare a CMACast fact sheet, including the process for user registration, and to provide this to CGMS Members and to WMO for further distribution to potential users in the Asia-Pacific region. Deadline: 31 March 2012

In response to Action 38.48, **EUM-WP-36**, reported on GEONETCast which consists of a network of three dissemination systems - GEONETCast Americas operated by NOAA, CMACast operated by CMA and EUMETCast operated by EUMETSAT.

The three GEONETCast Network Centres (GNC) operated by NOAA, CMA and EUMETSAT are interconnected with data exchange links for the exchange of GEONETCast relevant data. All three GNCs are operationally disseminating their own, and partners' GEONETCast contributions in their respective footprints.

EUMETSAT continues to support the GEO Workplan development and is involved in the GEONETCast related activities and demonstration events. Capacity Building and Training is actively supported through participation in various projects and initiatives, and with EUMETSAT's own training activities.

The interaction with users, provision of user stations to East European countries and the development of the EUMETSAT-CMA interface make a significant contribution to widen user access world-wide.

EUMETSAT and CMA have nearly completed the upgrade of their GNCs into a fully integrated GEONETCast data exchange and dissemination system, which includes a remote data access management interface.

NOAA-WP-31 reported on GEONETCast Americas (GNC-A) which is a regional contribution to the global GEONETCast system. GNC-A provides a satellite based system to deliver near-real-time, environmental products and data in support of the Global Earth Observation System of Systems societal benefit areas (agriculture, energy, health, climate, weather, disaster mitigation, biodiversity, water resources, and ecosystems).

GEONETCast Americas serves much of North America and the Caribbean Basin and all of Central, and South America. GEONETCast has links with regional environmental data dissemination systems deployed in Europe and Asia.

GEONETCast Americas broadcasts to inexpensive satellite receiver stations based on Digital Video Broadcast standards that are in the geographic footprint of the commercial satellite; currently Intelsat 9.

The Chairman thanked NOAA for the good cooperation and progress made with the enhancements to the GEONETCast Americas system over the last year. He added that EUMETSAT was on the verge of becoming a member of the Charter on natural disasters. He further suggested that CMA might consider how it, too, could participate in Charter activities. CMA responded that it already had plans to supply data needed for disaster

monitoring in the Asia-Pacific region and in support of the nine GEO SBAs.

IV/4 Internet-Based Dissemination Services

No Working Papers were presented.

IV/5 Global Data Exchange

CMA-WP-11 reported on the operational procedure for the long-term preservation of data. At NSMC/CMA the received multi-mission data are stored online, near-line and offline, respectively with an indication as to whether the datasets are archived on disk array, automatic tape library, or tapes preserved elsewhere in the NSMC operational building. All generated products (i.e. level 0, level 1, and level 2) are archived and preserved in two copies for long-term preservation. The oldest archived product traces back to 1983. CMA is interested in the experience and practice of other Meteorological Satellite Operators regarding data preservation and welcomes the proposal for establishing a common guidance for archiving

In response to Action 38.50, **EUM-WP-38** reported on Long Term Data Preservation policy that is in operation since 1995, in order to maintain and provide access to its historic satellite data records. These records are maintained in the EUMETSAT Data Centre, a large multi-mission facility located at EUMETSAT headquarters which operationally archives all the organisation's satellite data and derived products.

Most importantly, the new EUMETSAT satellite programmes fund the transcription of previous programme archives so that they 'inherit' the existing archive, thus providing the means for long-term data preservation.

A number of principles exist and are followed to ensure a secure archiving of the ingested data in an operational environment and allowing the long-term access to the archived data. These principles are revised from time to time, e.g. due to the advent of new and larger storage media.

EUMETSAT remarked that it was interested in sharing its experience and practices with other Meteorological Satellite Operators with a view to establishing common guidelines for archiving, adding that a Task Team could be set up, working by email over the coming months, to establish guidelines for the implementation of the various principles adopted. WMO informed CGMS that European common guidelines on "Long Term Data Preservation" were being developed by a working group initiated by ESA with partner agencies, which could be a useful input for the proposed Task Team. The following actions were agreed:

Action 39.49: CGMS Members to nominate Points of Contact who can assist WMO with the development of common guidelines for long term data preservation. Deadline for nominations 31 December 2011. WMO to prepare a report on the guidelines to be presented to CGMS-40.

Action 39.50: The CGMS Secretariat to distribute to CGMS Members the Report on European Long-Term Data Preservation Guidelines, for information, once this has been finalised. Deadline: CGMS 40.

EUM-WP-37 reported on Data Distribution from the EUMETSAT Data Centre, which has strongly increased in the last years. In this context, improved interoperability and cooperation between partner organisations can be helpful to meet the growing user demand and facilitate easy access at the same time, e.g. by sharing global data sets to improve data access and increase redundancy.

Several programmatic, standardised interfaces including a collection discovery service, EO product search and ordering have been implemented in the EUMETSAT EO-Portal to enable Interoperability with Partner Organisations. Further standards and interfaces can be added to the available Interoperability infrastructure at EUMETSAT.

Regarding the sharing or mirroring of Archive data to support improved user access, EUMETSAT and NOAA NCDC plan to cooperate on the exchange of user relevant data sets, such as Climate Data Records, between their Archives.

NOAA-WP-28 reported on the National Climatic Data Center (NCDC) which is the world's largest active archive of weather and climate data with more than 2.5 petabytes of archived data. Its mission is to provide access and stewardship to the Nation's resource of global climate and weather related data and information, and assess and monitor climate variation and change. This effort requires the acquisition, quality control, processing, summarisation, dissemination, and preservation of a vast array of climatological data generated by the national and international meteorological services. During 2011, over 1 petabyte of data were downloaded by users from NCDC's online access services. NCDC's mission is global in nature and provides the U.S. climate representative to the World Meteorological Organization, the World Data Center System, and other international scientific programs.

The following Actions were agreed:

Action 39.51: All CGMS Members to propose using interoperability standards for providing and

sharing of climate data records and report on their efforts at the next meeting of CGMS. Deadline: CGMS 40.

Action 39.52: EUMETSAT and NOAA to report on their progress on sharing climate data records and using common interoperability standards for providing the data. Deadline: CGMS 40.

EUM-WP-39 summarised ongoing activities in the area of Third-Party Data Exchange. The document, structured in two parts, contained an assessment of the 3rd Party Data Services under consideration and a summary of the status of currently ongoing 3rd Party Data Service implementation activities.

NOAA-WP-29 gave information on NOAA's Administrative Order "Procedure for Scientific Records Appraisal and Archive Approval." The NOAA Climate Data Center (NCDC) implemented this initiative and incorporated industry established best practices such as Open Archival Information System Reference Model with lessons learned to improve data preservation and documentation. These initiatives were the building blocks used to create processes, documentation standards and templates to ensure secure data preservation supporting long-term data use and accessibility.

NCDC established an archive process that engages cross-center collaboration to ensure support for data ingest, documentation, preservation, access and customer service thereby ensuring complete support of the data and information. Several documents were recently developed to establish roles and responsibilities between the Data Provider and the Archive through Service Level Agreements, as well as detailed data transfer protocols, formats and access support in Submission Agreements. Metadata standards currently required by NOAA are Federal Geographic Data Committee (FGDC) with the goal of moving to International Organization for Standardization (ISO) 19115/19115-2 in the near future. NCDC plans to implement ISO compliant collection level metadata within the year to better enable data discovery and improve documentation.

Additional activities at NCDC are improving the ingest and archive process by incorporating file verification throughout the process and reconciliation of transferred data with the provider. These activities are planned to be operational in the coming year.

IV/6 Integrated Global Dissemination Service (IGDDS) Development

CMA-WP-19 reported on CMA's work regarding implementation of the WMO Information System (WIS). It informed CGMS that the GISC located at Beijing was endorsed by ET-GDDP in August, 2010; it has been in operation since 15 August 2011. CMA has applied for 4 DCPCs, of which the NMIC has been approved. Next, CMA is to improve its GISC services and setup the backup mechanism with other GISCs.

In response to a query from the Chairman, CMA clarified that it considered the provision of some of its satellite datasets as part of its WIS implementation. This was also confirmed by NOAA. JMA recalled that its JMA-WP-02, for discussion in Plenary, also contained a similar statement concerning satellite data as part of its WIS implementation.

WMO-WP-26 reported on the progress being made in the gathering of requirements for satellite data access, which was undertaken in different WMO Regions in the context of the Integrated Global Data Dissemination Service (IGDDS).

- The RA III/RA IV Satellite Data Requirements Task Team established by WMO, with the support of NOAA and INPE, is maintaining a record of data requirements from Central and South American countries, which has led to inclusion of additional products by NOAA in the GEONETCast-America broadcast stream.
- The RA I Dissemination Expert Group jointly established by WMO and EUMETSAT, has started to review the EUMETCast-Africa dissemination baseline, which has already led EUMETSAT to include additional products into EUMETCast-Africa.
- The RA II Pilot Project to develop support to NMHSs in Satellite Data, Products and Training includes "Identification of requirements from RA II Members" as one of its main tasks.
- A data requirements gathering process is also starting in RA V.

WMO thanked the satellite operators involved in this process. The attention and support provided to these initiatives help to adapt data distribution mechanisms and content to meet evolving user needs. They also directly contribute to capacity building by raising regional awareness on the availability of satellite data and products.

WMO-WP-17 described the proposed concept of a web-based Product Access Guide for satellite products within the WMO Space Programme website. Such an access guide would give greater visibility to satellite products made available by CGMS Members at the global level. The Product Access Guide would not store information on individual products, or the products themselves, but would rather point users to the respective sources, through an agreed categorisation. This approach is intended to avoid

any duplication of satellite operators' catalogues, but to provide a thematic high-level overview on what is available in terms of satellite products and where to get detailed information. Its completion would require full collaboration of CGMS satellite operators in order to harmonise and maintain the interfacing between the Product Access Guide and the operators' catalogues.

CGMS, generally supporting the proposal, agreed the following action:

Action 39.53: WMO to further refine the web-based Product Access Guide for satellite products, within the WMO Space Programme website, in collaboration with CGMS satellite operators. Deadline: CGMS 40.

In response to Actions 38.51, and 38.52, **WMO-WP-27** recalled that the WMO Information System (WIS) provides a means for Meteorological Satellite operators to improve the awareness of the WMO community of products and services available to WMO Members and their users from meteorological satellites. This is done by registering satellite data centres in WIS as National Centres (NCs) or Data Collection or Production Centres (DCPCs) so that metadata describing data, products and services can be discovered in WIS, and when required, data and products can be delivered to users though WIS. The document provided some background on WIS and the processes a centre should follow to participate in WIS. It indicated that five CGMS satellite operators were already registered, or had applied, as DCPC. WMO recalled CGMS Action 38.51 to all CGMS satellite operators to register as either DCPC or NC, and Action 38.52 to enable uploading their metadata to a Global Information System Centre (GISC).

The Chairman invited in particular IMD, ROSHYDROMET to consider completing their application processes.

It was also noted that a key element of registration was the requirement that satellite metadata had to be synchronised with the GISC.

The following action was agreed:

Action 39.54: All CGMS Members to report at the next CGMS meeting on their progress with the implementation of WIS. Deadline: CGMS-40.

IV/7 Coordination of Code Forms for Satellite Data

No Working Papers were presented under this agenda item.

IV/8 Conclusion and Preparation of WG Report

The meeting closed at 13:20 on 4 October 2011. It was agreed that a first draft of the WG Report would be available (electronically) for checking by participants (See Annex 4) late that day or early the following day.

Annexes:

ANNEX 1 AGENDA OF THE CGMS-39

ANNEX 2 LIST OF WORKING PAPERS PRESENTED

ANNEX 3 LIST OF PARTICIPANTS

ANNEX 4 LIST OF WORKING GROUP PARTICIPANTS

ANNEX 5 OPENING CEREMONY ADDRESSES

ANNEX 6 CGMS BASELINE FOR THE OPERATIONAL CONTRIBUTION TO THE GOS

AGENDA OF THE CGMS-39

3-7 November 2011

- PLENARY SESSION -

A. Introduction

A.1 Welcome
A.2 Election of Chairmen
A.3 Adoption of Schedule
A.4 Nomination of Drafting Committee
A.5 Review of Action Items from the Previous Meetings

B. Report on the Status of Current Satellite Systems

B.1 Polar Orbiting Meteorological Satellite Systems
B.2 Geostationary Meteorological Satellite Systems
B.3 Research and Development Satellite Systems
B.4 Other LEO Satellites
B.5 Spacecraft Anomalies from Solar and other Events

C. Report on Future Satellite Systems

C.1 Future Polar-Orbiting Meteorological Satellite Systems
C.2 Future Geostationary Meteorological Satellite Systems
C.3 Future Research and Development Satellite Systems
C.4 Future other LEO Satellites
C.5 Future HEO or Combinations of LEO and GEO Missions

D. Operational Continuity and Reliability

D.1 Global Planning, including Orbital Positions and Reconfiguration of the Space-based Component of the GOS
D.2 Inter-regional Contingency Measures
D.3 Long-term Global Contingency Planning

E. CGMS Response to WMO and other International Requirements

E.1 Support to WMO Meteorological Programmes and Projects
E.2 Support to GCOS and other Climate Monitoring Activities
E.3 Support to IOC, JCOMM and other Ocean Monitoring Activities
E.4 Support to GAW and other Atmospheric Chemistry Monitoring Activities
E.5 Support to Satellite Requirements of other International Programmes

F. Interaction with international partners

F.1 GEO
F.2 CEOS
F.3 Other International Partners

G. Working Group Reports

H. Other Items of Interest

H.1 Training
H.2 Information
H.3 Any other business

I. Final Session

I.1 Nomination of CGMS Representatives at WMO, WMO STG, CEOS and other Meetings
I.2 Nomination of Chairmen and Rapporteurs of Working Groups for CGMS-39
I.3 Nomination of Rapporteurs of IPWG, IROWG, ITWG, IWWG
I.4 Summary List of Actions from CGMS-39
I.5 Data and place of next meeting

AGENDA OF THE CGMS-39

- WORKING GROUP SESSIONS -

Working Group I: Telecommunications

I/0 Introduction
I/1 Review of actions from the Previous Meeting
I/2 Coordination of Frequency Allocations: SFCG, ITU and WRC Activities
I/3 Telecommunication Techniques
I/3.1 Coordination of International Data Collection & Distribution
I/3.2 Status and Problems of IDCS
I/3.3 Ships, including ASAP
I/4 Dissemination of DCP messages (GTS or other means)
I/5 Future Use of IDCS
I/6 Search and Rescue (S&R)
I/7 Review of Actions, Conclusion and Preparation

Working Group II: Satellite Products

II/0 Introduction
II/1 Review of Actions from the Previous Meeting
II/2 Image Processing Techniques
II/3q Satellite Data Calibration and Validation
II/4 Infrared/MicroWave sounding and ITWG Matters
II/5 Precipitation and IPWG Matters
II/6 Atmospheric Motion Vectors and IWWG Matters
II/7 Radio Occultation and IROWG Matters
II/8 Cloud and Ash/Dust Related Matters
II/9 Ocean Parameters
II/10 Other Parameters and Products
II/11 Conclusion and Preparation of WG Report

Working Group III: Contingency Planning

III/0 Introduction
III/1 Review of Actions from the Previous Meeting
III/2 Continuity and Contingency Matters for Geostationary Satellite Missions
III/3 Continuity and Contingency Matters for Polar-Orbiting Satellite Missions
III/4 Proposed Revision of the CGMS Baseline for Satellite Missions
III/5 Continuity of Operational Oceanographic Satellite Missions and other Missions Supporting Climate Monitoring
III/6 Conclusion and Preparation of WG Report

Working Group IV: Global Data Dissemination

IV/0 Introduction
IV/1 Review of Actions from the Previous Meeting
IV/2 Direct Readout and Direct Dissemination
IV/3 DVB-based Dissemination Services
IV/4 Internet-based Services
IV/5 Global Data Exchange
IV/6 Integrated Global Dissemination Service (IGDDS) Development
IV/7 Coordination of Code Forms for Satellite Data

LIST OF WORKING PAPERS SUBMITTED TO CGMS-39

CMA

WP Number	WP Title	Agenda Item	Action/ Recommendation
CGMS-39-CMA-WP-01	CMA Review of Action Items	A.5	
CGMS-39-CMA-WP-02	CMA Input to the CGMS Satellite Tables	A.5	P01
CGMS-39-CMA-WP-03	Status of CMA Polar-orbiting Meteorological Satellite System	B.1	
CGMS-39-CMA-WP-04	Status of CMA Geostatinoary Satellite System	B.2	
CGMS-39-CMA-WP-05	CMA Report on Preparations of Future FY-3	C.1	
CGMS-39-CMA-WP-06	CMA Report on preparations for FY-4 satellite	C.2	AWGIII 38.38
CGMS-39-CMA-WP-07	CMA List of Frequencies	G.I/2	AWGI 38.15
CGMS-39-CMA-WP-10	CMA Report on GSICS Activities	G.II/3	
CGMS-39-CMA-WP-09	CMA Report on FY-3 MW Instrument Calibration	G.II/3	AWGII 38.20
CGMS-39-CMA-WP-12	Inter-calibration and validation of FY-3B ERM Scanner	G.II/3	AWGII 38.35
CGMS-39-CMA-WP-08	FY-3 Optic and IR Instrument Calibration Anomalies	G.II/3	AWGII 38.20
CGMS-39-CMA-WP-13	CMA Report on Satellite Volcanic Ash monitoring and Operational Service	G.II/8	AWGII 38.31
CGMS-39-CMA-WP-14	CMA Report on Operational Dust Storm Remote Sensing	G.II/8	AWGII 38.32
CGMS-39-CMA-WP-15	CMA Report on Operational Use of Satellite Data for Nowcasting Convective Cloud System	G.II/8	AWGII 38.33
CGMS-39-CMA-WP-16	Pre-processing Package for FY-3 Polar-orbiting Satellites	G.IV/2	
CGMS-39-CMA-WP-18	CMA Report on Status of CMACast	G.IV/3	AWGIV 38.48
CGMS-39-CMA-WP-11	CMA Report on Long-Term Data Preservation	G.IV/5	AWGIV 38.50
CGMS-39-CMA-WP-19	CMA Report on its Work Regarding WIS Implementation	G.IV/6	AWGIV 38.49

CNSA

WP Number	WP Title	Agenda Item	Action/ Recommendation
CGMS-39-CNSA-WP-01	Status of the Current CNSA Earth Observation Missions	B.3	
CGMS-39-CNSA-WP-02	CNSA Future Earth Observations Missions	C.3	

CSA

WP Number	WP Title	Agenda Item	Action/ Recommendation
CGMS-39-CSA-WP-01	Polar Communications & Weather (PCW)	C.5	

ESA

WP Number	WP Title	Agenda Item	Action/ Recommendation
CGMS-39-ESA-WP-01	Status of the current ESA Earth Observation Missions	B.3	
CGMS-39-ESA-WP-02	Status of future ESA Earth Observation Missions	C.3	
CGMS-39-ESA-WP-03	ESA Support to GCOS and Other Climate Monitoring Activities	E.2	
CGMS-39-ESA-WP-04	ESA Answer to Action 37.04	H.3	

EUMETSAT

WP Number	WP Title	Agenda Item	Action/ Recommendation
CGMS-39-EUMETSAT-WP-01	Status of Actions and Recommendations resulting from CGMS-38	A.5	
CGMS-39-EUMETSAT-WP-02	Current and future leo/geo/R&D satellite tables updated 14.10.2011	A.5	P01
CGMS-39-EUMETSAT-WP-03	Status of EUMETSAT Polar System (EPS)	B.1	
CGMS-39-EUMETSAT-WP-04	Status of the Meteosat System	B.2	
CGMS-39-EUMETSAT-WP-24	EUMETSAT Report on Satellite Calibration Anomalies	B.5	AWGII 38.20
CGMS-39-EUMETSAT-WP-12	EUMETSAT Report on Activities on Space Debris/Collision Mitigation Measures	B.5	
CGMS-39-EUMETSAT-WP-05	Report on Spacecraft Anomalies from Solar Events	B.5	P02
CGMS-39-EUMETSAT-WP-07	Plans for EPS-SG	C.1	
CGMS-39-EUMETSAT-WP-06	Status of preparations for MetOp B	C.1	
CGMS-39-EUMETSAT-WP-09	Status of Meteosat Third Generation (MTG)	C.2	
CGMS-39-EUMETSAT-WP-08	Status of preparations for MSG-3 and MSG-4	C.2	
CGMS-39-EUMETSAT-WP-11	Status of Sentinel 3 Programme in EUMETSAT	C.4	
CGMS-39-EUMETSAT-WP-10	Status of Jason-3 and follow-on	C.5	
CGMS-39-EUMETSAT-WP-40	Status of EUMETSAT Satellite Application Facilities (SAFs) - Current Initiatives	E.1	
CGMS-39-EUMETSAT-WP-15	EUMETSAT Contributions to Climate Monitoring including Peer Review of Climate Data Records	E.2	R38.03
CGMS-39-EUMETSAT-WP-41	Development of a Global Architecture for Climate Monitoring	E.2	
CGMS-39-EUMETSAT-WP-17	EUMETSAT contribution to GMES	F.3	
CGMS-39-EUMETSAT-WP-33	WG-I: Status of Actions (prior to CGMS meeting)	G.I	
CGMS-39-EUMETSAT-WP-21	Answer to action 38.15: EUMETSAT Report on the list of frequencies used by current and future systems	G.I/2	AWGI 38.15
CGMS-39-EUMETSAT-WP-22	EUMETSAT Report on Frequency Management Topics	G.I/2	
CGMS-39-EUMETSAT-WP-26	Report on Creation of Validation Datasets for Rainfall Products	G.II/5	AWGII 38.26
CGMS-39-EUMETSAT-WP-19	Report on Third International Workshop on Space-Based Snowfall Measurement	G.II/5	
CGMS-39-EUMETSAT-WP-28	IWWG Work Plan for a Second AMV Inter-comparison Study	G.II/6	AWGII 38.27
CGMS-39-EUMETSAT-WP-29	EUM Report on Validation Campaign for AMVs Derived with the NWCSAF Portable AMV Software Package	G.II/6	AWGII 38.29
CGMS-39-EUMETSAT-WP-27	Preparing for the 11th International Winds Workshop	G.II/6	
CGMS-39-EUMETSAT-WP-14	EUM Report on Support to the Working Group for Nowcasting Research of the World Weather Research Programme (WWRP-WGNR)	G.II/8	
CGMS-39-EUMETSAT-WP-30	EUM Report on Capabilities and plans to support Volcanic Ash Monitoring	G.II/8	AWGII 38.31
CGMS-39-EUMETSAT-WP-32	EUM Report on Nowcasting Applications, including Cloud Analysis, Fog Detection and Forest Fires	G.II/8	AWGII 38.33
CGMS-39-EUMETSAT-WP-13	EUMETSAT Report on List of Ocean Products and OSI SAF Products	G.II/9	
CGMS-39-EUMETSAT-WP-23	Eumetsat Report on Availability of IASI Level-1 Product Extraction Software for Direct Readout	G.II/10	
CGMS-39-EUMETSAT-WP-35	Status of the EUMETSAT Broadcast Services for EPS-SG	G.IV/2	AWGIV 38.47
CGMS-39-EUMETSAT-WP-34	EUMETSAT Report on the Evolution of Data Dissemination	G.IV/2	AWGIV 38.45
CGMS-39-EUMETSAT-WP-36	Report on GEONETCast	G.IV/3	AWGIV 38.48
CGMS-39-EUMETSAT-WP-37	EUMETSAT Report on Interoperability and Standardisation for Archived Data Access	G.IV/5	AWGIV 38.49
CGMS-39-EUMETSAT-WP-38	EUMETSAT Report on Long-Term Data Preservation	G.IV/5	AWGIV 38.50

WP Number	WP Title	Agenda Item	Action/ Recommendation
CGMS-39-EUMETSAT-WP-39	Third Party Data Exchange Activities	G.IV/5	
CGMS-39-EUMETSAT-WP-31	EUMETSAT Report on WMO Dust Project Training Support	H.1	AWGII 38.32
CGMS-39-EUMETSAT-WP-18	Report on EUMETSAT Training Activities	H.1	
CGMS-39-EUMETSAT-WP-20	EUMETSAT Conferences and Publications	H.2	

IMD

WP Number	WP Title	Agenda Item	Action/ Recommendation
CGMS-39-IMD-WP-01	Retrieval and validation of Atmospheric Motion Vectors from Indian National Satellite System KALPANA-1	G.II/6	
CGMS-39-IMD-WP-02	GPS Meteorology: Under Estimation of IPWV by Ground Based GPS system in some meso-scale Thunder storms – A case study	G.II/7	R38.07 WGI
CGMS-39-IMD-WP-24	Recent advances in satellite application for Tropical Cyclone monitoring and forecasting over North Indian Ocean	G.II/10	
CGMS-39-IMD-WP-05	Recent developments in predicting atmospheric instability with MODIS profiles using real time direct broadcast data over the Indian region	G.II/10	

IOC-UNESCO

WP Number	WP Title	Agenda Item	Action/ Recommendation
CGMS-39-IOC-UNESCO-WP-01	Sea Surface Temperature for Numerical Weather Prediction	E.3	AWGII 38.34

JAXA

WP Number	WP Title	Agenda Item	Action/ Recommendation
CGMS-39-JAXA-WP-01	Update on the Status of JAXA's Current Satellite Systems	B.3	
CGMS-39-JAXA-WP-02	Update on the Status of JAXA's Future Satellite Systems	C.3	

JMA

WP Number	WP Title	Agenda Item	Action/ Recommendation
CGMS-39-JMA-WP-01	Review of Action Items	A.5	AWGIV 38.51
CGMS-39-JMA-WP-02	Multi-functional Transport Satellites (MTSAT) Status	B.2	AWGI 38.15, AWGIV 37.37, AWGIV 38.51, P01
CGMS-39-JMA-WP-03	Status of Follow-on Satellites to MTSAT-2 and Related Plans	C.2	AWGI 38.15
CGMS-39-JMA-WP-07	Preparation for New Products Expected from Follow-On Satellite	C.2, G.II/10	AWGIII 38.38

JMA Continued

WP Number	WP Title	Agenda Item	Action/ Recommendation
CGMS-39-JMA-WP-06	Progress Report on the RA II Pilot Project to Develop Support for NMHSS in Satellite Data, Products and Training (Second Phase: September 2010 – August 2011) and the Third-Phase Action Plan (September 2011 – August 2012)	E.1	A38.07
CGMS-39-JMA-WP-11	Contributions to the WMO CBS severe weather forecasting demonstration project (SWFDP)	E.1	R38.02
CGMS-39-JMA-WP-04	JMA's GSICS and SCOPE-CM activities	E.2, G.II/3	AWGII 38.20
CGMS-39-JMA-WP-04	JMA's GSICS and SCOPE-CM activities	E.2, G.II/3	AWGII 38.20
CGMS-39-JMA-WP-05	JMA's Atmospheric Motion Vectors	G.II/6	R38.14 WGII, R38.15 WGII
CGMS-39-JMA-WP-08	Nowcasting products based on MTSAT-1R Rapid Scan Observation	G.II/8	AWGII 38.31, AWGII 38.33
CGMS-39-JMA-WP-10	JMA'S activities for development of new multi channel sea surface temperature (SST) algorithm	G.II/9	
CGMS-39-JMA-WP-07	Preparation for New Products Expected from Follow-On Satellite	C.2, G.II/10	AWGIII 38.38
CGMS-39-JMA-WP-09	The Second Asia/Oceania Meteorological Satellite Users' Conference	H.2	

KMA

WP Number	WP Title	Agenda Item	Action/ Recommendation
CGMS-39-KMA-WP-01	Review of Action Items	A.5	
CGMS-39-KMA-WP-02	STATUS OF COMMUNICATION, OCEAN AND METEOROLOGICAL SATELLITE (COMS) Meteorological Imager (MI)	B.2	
CGMS-39-KMA-WP-03	Current Status of Geostationary Ocean Color Imager	B.2	
CGMS-39-KMA-WP-04	Tentative Plans for Follow-on Satellites	C.2	
CGMS-39-KMA-WP-05	KOMPSAT-5 Program	C.3	
CGMS-39-KMA-WP-11	Progress report on the RA II PILOT PROJECT to develop support for NMHSS in satellite data products and training (seconf phase September 2010 – August 2011) and the Third Phase Action Plan (September 2011– August 2012)	E.1	
CGMS-39-KMA-WP-06	KMA's GSICS Activities	G.II/3	
CGMS-39-KMA-WP-08	Current Status Atmospheric Motion Vector at KMA	G.II/6	
CGMS-39-KMA-WP-09	Current status of weather forecast support for nowcasting and very-short range forecast	G.II/8	
CGMS-39-KMA-WP-07	Report on the current status of the satellite data assimilation in Korea Meteorological Administration	G.II/10	
CGMS-39-KMA-WP-10	Current Status of COMS Products Services	G.II/10	
CGMS-39-KMA-WP-12	NMSC/KMA Activity To Promote Utilization of COMS Data in Asia-Pacific Region	H.3	

NASA

WP Number	WP Title	Agenda Item	Action/ Recommendation
CGMS-39-NASA-WP-01	NASA Current Missions	B.3	
CGMS-39-NASA-WP-02	NASA Future Missions	C.3	
CGMS-39-NASA-WP-07	NASA Calibration and Validation Update	G.II/3	
CGMS-39-NASA-WP-06	NASA Contributions to Precipitation Remote Sensing	G.II/5	
CGMS-39-NASA-WP-03	Radio Occultation Activities At NASA	G.II/7	
CGMS-39-NASA-WP-04	NASA Satellite Observations of Clouds, Ash, and Dust	G.II/8	
CGMS-39-NASA-WP-05	NASA Ocean Science and Technology Activities in 2010-2011	G.II/9	
CGMS-39-NASA-WP-08	Operational Use of NASA Research Satellite Data	H.3	

NOAA

WP Number	WP Title	Agenda Item	Action/ Recommendation
CGMS-39-NOAA-WP-01	Review of CGMS-38 Action Items	A.5	
CGMS-39-NOAA-WP-02	Polar Orbiting Operational Environmental Satellites	B.1	
CGMS-39-NOAA-WP-04	Geostationary Operational Environmental Satellite	B.2	
CGMS-39-NOAA-WP-03	Current Status of Jason-2 and planned activities for the Jason-3 Program	B.4	
CGMS-39-NOAA-WP-05	Anomalies From Solar Events	B.5	
CGMS-39-NOAA-WP-06	NOAA Report on Space Debris/Collision Mitigation Measures	B.5	
CGMS-39-NOAA-WP-07	Future Polar-orbiting Meteorological Satellite System	C.1	
CGMS-39-NOAA-WP-08	Future Geostationary Meteorological Satellite System	C.2	
CGMS-39-NOAA-WP-09	WITHDRAWN	C.5	
CGMS-39-NOAA-WP-36	The Global Space-based Inter-Calibration System	D.1	
CGMS-39-NOAA-WP-10	WITHDRAWN	E.1	
CGMS-39-NOAA-WP-11	STAR Participation in IPWG, IWWG, ITWG and the World Climate Research Programme Global Energy and Water Cycle Experiment Radiation Panel (WCRP GEWEX RP)	E.2	
CGMS-39-NOAA-WP-12	NOAA Report on the Global Cryosphere Watch	E.5	
CGMS-39-NOAA-WP-15	NOAA Plans for Utilization for the Band 7750-7850/7900 MHz	G.I/1	
CGMS-39-NOAA-WP-14	Current and Future NOAA Satellite Networks	G.I/2	
CGMS-39-NOAA-WP-16	Technical Input to the SFCG and ITU-R	G.I/2	
CGMS-39-NOAA-WP-17	Status of the International Data Collection System (IDCS)	G.I/3.2	
CGMS-39-NOAA-WP-18	High Resolution Imagery from NOAA's Current and Future Geostationary Operational Environmental Satellite Instruments – Opportunities for Advancements and Collaborations	G.II/2	
CGMS-39-NOAA-WP-21	NOAA Report on Satellite Calibration Anomalies	G.II/3	
CGMS-39-NOAA-WP-19	NOAA's Stratospheric Temperature Climate Data Record Derived from Recalibrated Stratospheric Sounding Unit Observations	G.II/4	
CGMS-39-NOAA-WP-22	The International TOVS Working Group (ITWG) International TOVS Study Conference (ITSC) XVII Summary Report	G.II/4	
CGMS-39-NOAA-WP-23	Rainfall Data Set over South Africa for Validating NOAA and EUMETSAT Satellite Rainfall Products	G.II/5	
CGMS-39-NOAA-WP-34	NOAA/NESDIS' Interest in the EUMETSAT Nowcasting Satellite Applications Facility's (NWC SAF) Atmospheric Motion Vector (AMV) Portable Software	G.II/6	

NOAA Continued

WP Number	WP Title	Agenda Item	Action/ Recommendation
CGMS-39-NOAA-WP-24	Differing Regional Capabilities in Satellite- based Volcanic Ash Cloud Detection	G.II/8	
CGMS-39-NOAA-WP-26	Nearcasts: Providing Short-range Forecasts of Clear-air Geostationary Satellite Products	G.II/8	
CGMS-39-NOAA-WP-20	NOAA Report on Progress Towards Using SSMIS to Extend the SSMI Records on Total Precipitable Water	G.II/10	
CGMS-39-NOAA-WP-25	NOAA Table of Polar-orbiting Satellite Equator Crossing Times and Frequencies	G.III/3	
CGMS-39-NOAA-WP-27	Broadcast Services for NOAA'S NPP/JPSS	G.IV/2	AWGIV 38.47
CGMS-39-NOAA-WP-30	The Current Status and Short Term Plans (2011-2015) of the GOES LRIT Service	G.IV/2	
CGMS-39-NOAA-WP-33	Direct Broadcast Beyond 2015	G.IV/2	
CGMS-39-NOAA-WP-31	The Current Status and Short Term Plans (2011-2015) of the GEONETCast Americas Service	G.IV/3	
CGMS-39-NOAA-WP-28	Improved Access to Climate Observations and Products in NOAA	G.IV/5	AWGIV 38.49
CGMS-39-NOAA-WP-29	Progress in Preservation of Climate Observations	G.IV/5	AWGIV 38.50
CGMS-39-NOAA-WP-13	Summary of Virtual-training Laboratory Activities	H.1	
CGMS-39-NOAA-WP-35	Recommendation for Review of CGMS Structure, Meetings, and Practices	H.3	

ROSCOSMOS

WP Number	WP Title	Agenda Item	Action/ Recommendation
CGMS-39-ROSCOSMOS-WP-01	ROSHYDROMET/ROSCOSMOS Review of CGMS-38 Action Items	A.5	
CGMS-39-ROSCOSMOS-WP-02	Status of the Russian Polar Orbiting Satellite System	B.1	
CGMS-39-ROSCOSMOS-WP-03	Status of Geostationary Meteorological Satellite ELECTRO-L №1	B.2	
CGMS-39-ROSCOSMOS-WP-04	Future of the Russian Polar-Orbiting Satellite System	C.1	
CGMS-39-ROSCOSMOS-WP-05	Future of the Russian Geostationary Satellite System	C.2	
CGMS-39-ROSCOSMOS-WP-06	Status of the Russian Data Collection System	G.I/3.2	

ROSHYDROMET

WP Number	WP Title	Agenda Item	Action/ Recommendation
CGMS-39-ROSHYDROMET-WP-01	ROSHYDROMET/ROSCOSMOS Review of CGMS-38 Action Items	A.5	
CGMS-39-ROSHYDROMET-WP-02	Status of the Russian Polar Orbiting Satellite System	B.1	
CGMS-39-ROSHYDROMET-WP-03	Status of Geostationary Meteorological Satellite ELECTRO-L №1-	B.2	
CGMS-39-ROSHYDROMET-WP-04	Future of the Russian Polar-Orbiting Satellite System	C.1	
CGMS-39-ROSHYDROMET-WP-05	Future of the Russian Geostationary Satellite System	C.2	
CGMS-39-ROSHYDROMET-WP-06	Status of the Russian Data Collection System	G.I/3.2	
CGMS-39-ROSHYDROMET-WP-07	Applications of Meteorological Satellite Data for Environment Monitoring and Climate Research in ROSHYDROMET	G.II	

WMO

WP Number	WP Title	Agenda Item	Action/ Recommendation
CGMS-39-WMO-WP-01	Report from the Inter-Programme Coordination Team on Space Weather (ICTSW)	B.5	
CGMS-39-WMO-WP-02	Revision of the CGMS baseline for contributing to the Global Observing System	D.1, G.III/4	AWGIII 38.39, AWGIII 38.41, R38.19 WGIII, R38.20 WGIII
CGMS-39-WMO-WP-03	Global Space-based Inter-Calibration System (GSICS) Progress Report	D.1, G.II/3	
CGMS-39-WMO-WP-04	Implementation Plan for the Evolution of Global Observing Systems (EGOS-IP)	E.1	
CGMS-39-WMO-WP-05	Update on the Severe Weather Forecasting Demonstration Project (SWFDP)	E.1	A38.11, A38.12, AWGII 38.33, R38.02
CGMS-39-WMO-WP-06	Evolving requirements for Space-based Remote Sensing of Volcanic Ash and Gaseous Aerosols for Aeronautical Meteorology	E.1	AWGII 38.31
CGMS-39-WMO-WP-07	Implementation Activities of the Global Climate Observing System	E.2	R38.03
CGMS-39-WMO-WP-08	Strategy towards an Architecture for Climate Monitoring from Space	E.2	A38.05, A38.13
CGMS-39-WMO-WP-09	Status of the Global Atmospheric Watch (GAW) Satellite Observation Requirements Update	E.4	AWGIII 38.40
CGMS-39-WMO-WP-10	Update on Global Cryosphere Watch	E.5	A38.10, R38.04
CGMS-39-WMO-WP-11	Outcome of the WCRP Observation and Assimilation Panel (WOAP) Workshop on Evaluation of Satellite Related Global Climate Datasets	E.5	A38.03
CGMS-39-WMO-WP-12	First Announcement of the Fourth WCRP Reanalysis Conference	E.5	A38.03
CGMS-39-WMO-WP-13	New On line Database of Observing Requirements	E.5	
CGMS-39-WMO-WP-19	Radio-Frequency Coordination	G.I/2	
CGMS-39-WMO-WP-25	Change of Geographical in the HRIT/LRIT Global Specification Reference System	G.I/3, G. IV/2	
CGMS-39-WMO-WP-28	Workplan for the Establishment of an International Forum of Users of Satellite Data Telecommunications	G.I/5	
CGMS-39-WMO-WP-03	Global Space-based Inter-Calibration System (GSICS) Progress Report	D.1, G.II/3	
CGMS-39-WMO-WP-20	Report on activities of the International Precipitation Working Group (IPWG)	G.II/5	
CGMS-39-WMO-WP-21	Satellite Products in Support of the SWFDP for the Lake Victoria Basin Region	G.II/9	
CGMS-39-WMO-WP-30	Satellite Information Requirements for Coastal Inundation Forecasting and Warning	G.II/9	
CGMS-39-WMO-WP-22	Outcome of the International Workshop on Satellite Analysis of Tropical Cyclones	G.II/10	
CGMS-39-WMO-WP-23	Outcome of GCOS Implementation Plan Satellite Supplement Updating	G.II/10, G.III/5	
CGMS-39-WMO-WP-02	Revision of the CGMS baseline for contributing to the Global Observing System	D.1, G.III/4	AWGIII 38.39, AWGIII 38.41, R38.19 WGIII, R38.20 WGIII
CGMS-39-WMO-WP-24	Outcome of the Workshop on Continuity and Architecture Requirements for Climate Monitoring	G.III/4	AWGIII 38.37
CGMS-39-WMO-WP-23	Outcome of GCOS Implementation Plan Satellite Supplement Updating	G.II/10, G.III/5	
CGMS-39-WMO-WP-31	Gap Analysis for Satellite Missions Supporting the GOS	G.III/5	AWGIII 38.43
CGMS-39-WMO-WP-33	Gap Analysis for Satellite Missions supporting the GOS	G.III/5	
CGMS-39-WMO-WP-25	Change of Geographical Reference System in the HRIT/LRIT Global Specification	G.I/3, G.IV/2	

WMO Continued

WP Number	WP Title	Agenda Item	Action/ Recommendation
CGMS-39-WMO-WP-17	Development of a Satellite Product Access Guide	G.IV/6	
CGMS-39-WMO-WP-26	Regional Requirements Gathering for Satellite Data Access	G.IV/6	
CGMS-39-WMO-WP-27	WIS Data Collection or Production Centre (DCPC) or National Centre (NC) Designation Procedure	G.IV/6	AWGIV 38.51, AWGIV 38.52
CGMS-39-WMO-WP-14	Report from the Virtual Laboratory	H.1	
CGMS-39-WMO-WP-15	New CIMO Guide Part on Satellite Observations	H.1	
CGMS-39-WMO-WP-16	Dossier on the Space-based Global Observing System in 2011	H.2	P01
CGMS-39-WMO-WP-32	Update on the WMO dossier on the Space Based Global Observing System	H.2	
CGMS-39-WMO-WP-18	Outcome of the Biennial Questionnaire on Satellite Data Availability and Use	H.3	

LIST OF PARTICIPANTS AT CGMS-39

MEMBERS

CMA

Mr Dongfeng LUO	Deputy Chief for data service office, NSMC
Mrs Tian Tian WANG	Principal staff member
Mrs Chufang WANG	Senior Engineer
Dr Xuebao WU	Management Specialist
Mr Jun YANG	Director-General of Department of Integrated Observation
Prof Dr. Peng ZHANG	Director of Office of System Development, NSMC
Prof Zhiqing ZHANG	Chief Designer

CNSA

Dr Jun GAO	Deputy Director of Department of System Engineering
Prof Dr Qingyan MENG	Professor

ESA

Mr Jean-Louis FELLOUS	Advisor Expert

EUMETSAT

Mr Gordon BRIDGE	USD Training Consultant
Mr Paul COUNET	Head of Strategy and International Relations
Dr Simon ELLIOTT	Product Integration Manager
Dr Volker GAERTNER	Head of User Service Department
Mr Joaquin GONZALEZ	Head of System Engineering Support Division
Mr Alain RATIER	Director-General
Mr Mikael RATTENBORG	Director of Operations
Mr Klaus-Peter RENNER	Dissemination Manager
Dr Johannes SCHMETZ	Head of Meteorological Division
Mrs Sarah STOECKEL	CGMS Secretariat
Mr Lothar WOLF	Dissemination Services Team Leader

IMD

Dr Vaddi RAJESWARA RAO	Scientist-E

IOC-UNESCO

Dr David HALPERN	Senior Advisor, NASA Earth Science Research

JAXA

Dr Tamotsu IGARASHI	Manager for Applications Research, EORC
Mr Kazuo UMEZAWA	Associate Senior Engineer, EORC

JMA

Dr Hiroshi KUNIMATSU	Scientific Officer, Meteorological Satellite Center
Mr Toshiyuki KURINO	Senior Coordinator, Satellite Program Division

KMA

Sung Rae CHUNG	Senior Researcher, Satellite Analysis Division
Dr Jae-Dong JANG	Deputy Director, Satellite Operation Division
Dr Dohyeong KIM	Senior Researcher, Satellite Planning Division
Mr Sungduck YOON	Director, Satellite Planning Division

NASA

Dr Jack KAYE	Associate Director for Earth Science Research
Prof Dr Erich STOCKER	GPM Deputy Project Scientist for Data

NASA CEOS

Dr Brian KILLOUGH	CEOS Systems Engineering Office

NOAA

Mr Mitch GOLDBERG	Division Chief, Satellite Meteorology and Climatology
Mrs Suzanne HILDING	Action Director, Office of Systems Development
Ms Kimberly HURST	Management Specialist
Mr John MURPHY	Chief, Programs and Plans Division (NOAA/NWS/OST)
Mr Marlin O. PERKINS	Direct Readout Program Manager
Mr Charles WOOLDRIGE	Deputy Director, International and Interagency Affairs Office (NESDIS)

ROSCOSMOS

Mr Mikhail KHAYLOV	Chief of Department of the Engineering Policy and Quality

FSUE TSENKI

Mr Valery ERMAKOV	Deputy Chief of Division

FSUE VNIIEM

Dr Sergey VOLKOV	First Deputy Director General-Designer General
Dr Mikhail NOVIKOV	Chief Designer

Lavochkin Scientific Production Association

Mr Ivan MOSKATINIEV	Chief of the Center of Payload Equipment
Mr Alexander TKACHENKO	Leading Designer

JSC RKS (Russian Space Systems)

Dr Yuriy GEKTIN	Chief Designer
Dr Nina NOVIKOVA	Head of NTs OMZ Division

FSUE TSNIIMASH

Dr Fedor LUBCHENKO	Chief of Department

ROSHYDROMET

Dr Valery DYADYUCHENKO	Deputy Head
Ms Elena BAEVA	Principal Specialist
Mr Vladimir BOGDANOV	Deputy Head Advisor
Mrs Tatiana LABENETS	Principal Specialist

FSBI SRC PLANETA

Prof Vasily ASMUS	Director
Dr Oleg MILEKHIN	Deputy Director
Prof. Alexander USPENSKY	Principal Scientist
Dr Valery SOLOVJEV	Chief of Department
Mr Vladimir ZAGREBAEV	Chief of Department

FSBI SRC PLANETA Secretariat

Mrs Tatiana BURTSEVA	Chief of Department
Mr Sergey EKIMOV	Administrative Support/Driver
Mr George PARKHOMENKO	Leading Engineer
Ms Marina MOLDAVSKAYA	Engineer
Mr Sergey USPENSKY	Chief of Department

WMO

Mr Bizzarro BIZZARRI	Consultant
Dr Stephan BOJINSKI	Scientific Officer, Satellite Utilization and Products
Mr Jérôme LAFEUILLE	Chief, Space-based Observing System Division
Mrs Barbara RYAN	Director, WMO Space Programme

OBSERVERS

CSA

Mr Guennadi KROUPNIK	Director, Satellite Communications and Space Environment Projects

EC

Mr Mike MANORE	Director, Network Strategies and Design

WMO GCOS

Dr Carolin RICHTER	Director GCOS Secretariat
Dr Alexander ZAYTSEV	Main Geophysical Observatory

LIST OF WORKING GROUP PARTICIPANTS

PARTICIPANTS OF WORKING GROUP I: TELECOMMUNICATIONS

CMA

Mr Dongfeng LUO	Deputy Chief for data service office, NSMC
Mrs Tian Tian WANG	Principal staff member
Prof Zhiqing ZHANG	Chief Designer

CNSA

Dr. Jun GAO	Deputy Director of Department of System Engineering

EUMETSAT

Mr Joaquin GONZALEZ	Head of System Engineering Support Division (Rapporteur)
Mr Mikael RATTENBORG	Director of Operations

JAXA

Dr Tamotsu IGARASHI	Manager for Applications Research, EORC

JMA

Mr Toshiyuki KURINO	Senior Coordinator, Satellite Program Division

KMA

Dr. Jae-Dong JANG	Deputy Director, Satellite Operation Division

NOAA

Mr Marlin O. PERKINS	Direct Readout Program Manager (Chairman)
Mr Charles WOOLDRIGE	Deputy Director, International and Interagency Affairs Office (NESDIS)

ROSHYDROMET

Dr Valery DYADYUCHENKO	Deputy Head of ROSHYDROMET

FSBI SRC PLANETA

Mr Vladimir ZAGREBAEV	Chief of Department

FSBI SRC PLANETA Secretariat

Mr George PARKHOMENKO	Leading Engineer
Mr Sergey USPENSKY	Chief of Department

WMO

Mr Jérôme LAFEUILLE	Chief, Space-based Observing System Division

OBSERVERS

CSA

Mr Guennadi KROUPNIK	Director, Satellite Communications and Space Environment Projects

PARTICIPANTS OF WORKING GROUP II: SATELLITE PRODUCTS

CMA

Dr Xuebao WU	Management Specialist
Prof Dr. Peng ZHANG	Director of Office of System Development, NSMC

CNSA

Prof Dr Qingyan MENG	Professor

ESA

Mr Jean-Louis FELLOUS	Advisor Expert

EUMETSAT

Dr Volker GAERTNER	Head of User Service Department
Dr Johannes SCHMETZ	Head of Meteorological Division (Co-rapporteur)
Dr Simon ELLIOTT	Product Integration Manager

IMD

Dr Vaddi RAJESWARA RAO	Scientist-E (Co-Chairman)

IOC-UNESCO

Dr David HALPERN	Senior Advisor, NASA Earth Science Research

JAXA

Mr Kazuo UMEZAWA	Associate Senior Engineer, EORC

JMA

Dr Kunimatsu HIROSHI	Scientific Officer, Meteorological Satellite Center

NASA

Dr Jack KAYE	Associate Director for Research
Prof Dr Erich STOKER	GPM Deputy Project Scientist for Data

NASA CEOS

Dr Brian KILLOUGH	CEOS Systems Engineering Office

NOAA

Mr Mitch GOLDBERG	Division Chief, Satellite Meteorology and Climatology (Co-rapporteur)

ROSCOSMOS JSC RKS (Russian Space Systems)

Dr Yuriy GETKIN	Chief Designer

Lavochkin Scientific Production Association

Mr Ivan MOSKATINIEV	Chief of the Center of Payload Equipment

ROSHYDROMET

Mr Vladimir BOGDANOV	Principal Specialist
Ms Elena BAEVA	Principal Specialist

FSBI SRC PLANETA

Prof Vasily ASMUS	Director (Co-chairman)
Dr Oleg MILEKHIN	Deputy Director
Dr Valery SOLOVJEV	Chief of Department
Mr Vladimir ZAGREBAEV	Chief of Department
Mr Sergei USPENSKY	Chief of Department
Prof Alexander USPENSKY	Principal Scientist

WMO

Dr Barbara RYAN	Director, WMO Space Programme
Dr Stephan BOJINSKI	Scientific Officer, Satellite Utilization and Products

OBSERVERS

EC

Mr Mike MANORE	Director, Network Strategies and Design

GCOS

Dr Alexander ZAYTSEV	Main Geophysical Observatory

PARTICIPANTS OF WORKING GROUP III: GLOBAL CONTINGENCY PLANNING

CMA

Mr Jun YANG	Director of the National Satellite Meteorological Center
Mrs Tian Tian WANG	Principal staff member

CNSA

Dr Jun GAO	Deputy Director of Department of System Engineering

EUMETSAT

Mr Paul COUNET	Head of Strategy and International Relations
Mr Joaquin GONZALEZ	Head of System Engineering Support Division
Mr Mikael RATTENBORG	Director of Operations

JAXA

Dr Tamotsu IGARASHI	Manager for Applications Research, EORC

JMA

Mr Toshiyuki KURINO	Senior Coordinator, Satellite Program Division

KMA

Dr Jae-Dong JANG	Deputy Director, Satellite Operation Division

NASA

Dr Jack KAYE	Associate Director for Earth Science Research

NOAA

Mr Marlin O. PERKINS	Direct Readout Program Manager
Mr Charles WOOLDRIGE	Deputy Director, International and Interagency Affairs Office (NESDIS)
Mrs Suzanne HILDING	Action Director, Office of Systems Development (Chairwoman)
Ms Kimberly HURST	Management Specialist

ROSCOSMOS

Mr Mikhail KHAYLOV	Chief of Department of the Engineering Policy and Quality

Lavochkin Scientific Production Association

Mr Alexander TKACHENKO	Chief of Department of the Engineering Policy and Quality

ROSHYDROMET

Dr Valery DYADYUCHENKO	Deputy Head of ROSHYDROMET

WMO

Mr Jérôme LAFEUILLE	Chief, Space-based Observing System Division (Rapporteur)
Mrs Barbara RYAN	Director, WMO Space Programme

CSA

Mr Guennadi KROUPNIK	Director, Satellite Communications and Space Environment Projects

GCOS

Dr Carolin RICHTER	Director GCOS Secretariat

PARTICIPANTS OF WORKING GROUP IV: GLOBAL DATA DISSEMINATION

CMA

Mrs Tian Tian WANG	Principal staff member
Mrs Chufang WANG	Senior Engineer
Mr Dongfeng LUO	Deputy for data service office, NSMC
Prof. Zhiqing ZHANG	Chief Designer

EUMETSAT

Mr Gordon BRIDGE	USD Training Consultant (Rapporteur)
Mr Paul COUNET	Head of Strategy and International Relations
Dr Simon ELLIOTT	Product Integration Manager
Dr Volker GAERTNER	Head of User Service Department
Mr Joaquin GONZALEZ	Head of System Engineering Support Division
Mr Mikael RATTENBORG	Director of Operations (Chairman)
Mr Klaus-Peter RENNER	Dissemination Manager
Mr Lothar WOLF	Dissemination Services Team Leader

JAXA

Dr. Tamotsu IGARASHI	Manager for Applications Research, EORC

JMA

Mr Toshiyuki KURINO	Senior Coordinator, Satellite Program Division

KMA

Dr Jae-Dong JANG	Deputy Director, Satellite Operation Division

NASA

Prof Dr Erich STOKER	GPM Deputy Project Scientist for Data

NOAA

Mr Marlin O. PERKINS	Direct Readout Program Manager
Mr Charles WOOLDRIGE	Deputy Director, International and Interagency Affairs Office (NESDIS)

ROSCOSMOS Lavochkin Scientific Production Association

Mr Ivan MOSKATINIEV	Head of department of payload equipment
Mr Alexander TKACHENKO	Chief Designer

FSBI SRC PLANETA

Mr Vladimir ZAGREBAEV	Chief of Department

WMO

Mr Jérôme LAFEUILLE	Chief, Space-based Observing System Division
Dr. Stephan BOJINSKI	Scientific Officer, Satellite Utilization and Products

OBSERVERS

CSA

Mr Guennadi KROUPNIK	Director, Satellite Communications and Space Environment Projects

EC

Mr Mike MANORE	Director, Network Strategies and Design

WMO GCOS

Dr Alexander ZAYTSEV	Main Geophysical Observatory

OPENING CEREMONY ADDRESSES

INAUGURAL CEREMONY OF CGMS-39

3-7 October 2011, St Petersburg, Russia

Welcome Address by V. Dyadyuchenko

Dear participants of the 39th meeting of the Coordination Group for Meteorological Satellites (CGMS)! On behalf of the Russian Federal Service for Hydrometeorology and Environmental Monitoring I welcome you and I hope our meeting here in the city of Saint-Petersburg will be a success!

We highly appreciate the role of CGMS in the continuous creation of joint international space meteorological systems that consists of national orbital satellite groups belonging to countries and organizations who are members of the CGMS. Russia's recent contribution to this system was the launch of the polar-orbiting Meteor-M1 satellite in 2009 and the geostationary Elektro-L1 satellite in 2011. New meteorological satellites of the «Meteor-M» and «Elektro-L» series are planned to be launched soon. Also, a new Russian satellite «Canopus-V» №1 is to be launched in the near future. It is designed for different environment monitoring tasks including natural and technogenic emergency situations, disasters of hydrometeorological origin, and the study of earthquake predictors.

Roshydromet is highly interested in further extension of international collaboration in the sphere of space hydrometeorology and environment monitoring. Such collaboration proves to be very beneficial to all countries that take part in it. It helps to obtain vast amounts of satellite data from the joint orbital system.

It also provides easier access to advanced technologies and achievements in the sphere of meteorological satellites and their scientific payload development, earth sensing instruments calibration, satellite data validation and implementation of new ways of processing and dissemination of satellite data.

In the framework of this collaboration different training programmes are being carried out, also with the use of virtual laboratories. Actions are taken for adjustment of orbital parameters of national meteorological satellites and for inter-coordination of their scientific payload characteristics. Complex but necessary work is underway on achieving mutually acceptable solutions in radio frequency band allocation issues and other problems concerning telecommunication support of space hydrometeorological data acquisition and dissemination.

By all means I named not all advantages and benefits of international collaboration on space meteorology and environment monitoring. This list can be continued on, but the most important thing that I want to focus on is that CGMS is playing the leading part in all aspects and spheres of this international collaboration.

In fact, CGMS is acting as an «unofficial government» regarding the work on solving of all problems on cooperation and interaction between different national meteorological and space agencies and organizations. For now it is almost 40 years CGMS is successfully playing this vital role.

I am sure, that the current 39th CGMS session in the Russian city of Saint-Petersburg will be no less effective and fruitful than previous regular sessions that took place in New Delhi, Cheju island, Maspalomas and other places. Roshydromet has made significant preparations for this session. We hope that all participants will be satisfied with their stay in Saint-Petersburg and will actively take part in the 39-th session of CGMS.

I also want to thank our colleagues from EUMETSAT and the CGMS Secretariat for their contribution in preparing the current session.

The Saint-Petersburg city administration has also given us an invaluable support.

Thank you for your attention.

OPENING SESSION OF CGMS-39

Monday, 3 October 2011, St Petersburg, Russian Federation

Address by the Director of Operations of EUMETSAT, Mikael Rattenborg

Distinguished Delegates and Observers, Ladies and Gentlemen,

On behalf of the CGMS Secretariat I am pleased and honored to welcome all the participants to the 39th Meeting of the Coordination Group for Meteorological Satellites.

CGMS is very pleased that the Russian Federation is hosting the CGMS meeting this year, and I would like to express my sincere thanks to Dr Alexander Frolov, Head of Roshydromet, and General Vladimir Popovkin, Head of Roscosmos, for kindly inviting us to the meeting here in St Petersburg. Roshydromet joined CGMS in 1973, only one year after the founding of CGMS. Roscosmos joined 30 years later in 2003, and the latest CGMS meeting on Russian soil took place in 2004 in Sochi.

Due to its distinctive international nature, EUMETSAT has been able to fully appreciate the importance of CGMS, its success over the years as a dedicated global forum for the coordination of operational meteorological satellite systems, and its efforts to ensure the exchange of key information on operational meteorological satellite systems and research and development missions. The extensive attendance to CGMS-39 can be regarded as a shared acknowledgment to the achievements of CGMS and to its central role in addressing issues associated with meteorological satellite operations, products, data delivery and data exchange.

CGMS is fostering the harmonization of meteorological satellite mission parameters, and encouraging complementarity, compatibility and possible mutual backup in the event of system failure. CGMS is thus complementary to other multilateral cooperation mechanisms such as the Space Program of the World Meteorological Organization (WMO), the Global Climate Observing System (GCOS), the Committee on Earth Observation Satellites (CEOS) and the Group on Earth Observations (GEO).

Meteorological satellites represent a key component of the Global Observing System. The crucial task of enabling operational satellite operators, research and development institutions and WMO to ensure efficiency and sustainability, through technical and operational coordination, lies within CGMS.

CGMS activities and initiatives appear to become more and more crucial. The continuous evolution of Earth observation systems and the related effort for international coordination and information exchange are leading to improved data and products and better services to the citizens at large.

The constant attention to climate change and extreme weather events by international public opinion is increasing the awareness for the possibilities provided by Earth Observation for protecting life and property, and advancing living standards and social and economic development. There is evidence of an ongoing attitude and policy change, and consequently we, as CGMS, have consciously taken steps to address this.

To build a stronger CGMS, I believe that we need to continue to evolve, cooperate, exchange data, and ensure data availability and continuity.

Furthermore, we also need to ensure the coordination of resources and global observation coverage to minimize observational gaps as far as possible. We are already doing this to a certain extent between the continents but we have to improve it further.

In this respect there are few points I would like to highlight for this meeting:

Firstly, global data exchange and orbit coordination. We shall seek further ways to improve and enhance these activities during our discussions for the benefit of our users.

Secondly, following the latest WMO Congress (Cg-XVI), it was agreed to define and implement an international architecture that ensures delivery of satellite observations for climate monitoring. This should cover time-frames required for analysis of the Earth's climate system in order to meet policy and user-service needs. The stakeholders for defining such an architecture includes this forum - CGMS. It will be addressed in Working Papers during the week and I would like to encourage you to provide constructive feedback to maximise our input to this process.

Overall, I encourage active discussions and hope that we can come to beneficial conclusions for both the space agencies and - in particular - our users.

Concluding my address, I wish to confirm EUMETSAT's long-standing commitment to CGMS, as well as the aspiration to continuing our support to CGMS by running its Secretariat.

In addition, I would like to give my special thanks to the organising committee for the excellent organisational arrangements.

EUMETSAT is looking forward to constructive discussions throughout the week, as an excellent opportunity for advancing international cooperation on satellite meteorology, Earth observation, and its contribution to climate change monitoring.

I wish you fruitful discussions and a successful CGMS meeting.

Thank you for your attention.

CGMS BASELINE FOR THE OPERATIONAL CONTRIBUTION TO THE GOS

(adopted by CGMS-39 on 6 October 2011)

FUTURE SATELLITE MISSIONS TO BE PERFORMED ON OPERATIONAL/ SUSTAINED BASIS

Introduction

In support of the programmes coordinated or co-sponsored by WMO for weather and climate, CGMS Members plan to maintain the operational capabilities and services described below, that constitute the "CGMS baseline for the operational contribution to the GOS".

While this particular document focuses on missions that are decided and managed in an operational or sustained framework, with a perspective of long-term follow-on, this in no way precludes the importance of other missions undertaken e.g. on a research or demonstration basis. First of all, because today's research and development are the foundation of tomorrow's operational missions. Furthermore, because many missions initiated in an R&D framework for a limited duration are eventually extended well beyond their design life time and provide longstanding support to both scientific and operational activities.

This baseline defines a constellation of geostationary satellites, a core meteorological mission on three sun-synchronous orbits, other missions in sun-synchronous orbits, missions in other Low Earth Orbits, and contains cross-cutting considerations on contingency planning, inter-calibration, data availability and dissemination.

I. Constellation in geostationary orbit

At least six geostationary satellites shall be operated at evenly distributed locations with in orbit redundancy, and perform the following missions:

a. Advanced visible and infrared imagery (at least 16 spectral channels, 2km resolution) over the full disc at least every 15 minutes
b. Infrared sounding (hyperspectral on some positions)
c. Lightning detection
d. Data collection
e. Space environment monitoring

On selected positions, the following missions shall be performed:

f. Earth Radiation Budget monitoring
g. High spectral resolution UV sounding
h. Solar activity monitoring

II. LEO sun-synchronous missions

Operational sun-synchronous satellites shall be operated around three orbital planes in mid-morning ("am", nominally 09:30 descending, 21:30 ascending ECT), afternoon ("pm", nominally 13:30 ascending ECT) and early morning (nominally 05:30 descending, 17:30 ascending ECT) and, as a constellation, shall perform the following missions:

1) Core meteorological mission nominally on 3 orbital planes

i. Multispectral visible and infrared imagery
j. Infrared hyperspectral sounding (at least am and pm)
k. Microwave sounding
l. Microwave imagery

2) Other missions on sun-synchronous orbits

m. Wind scatterometry over sea surfaces (at least two orbital planes)
n. Ocean surface topography by radar altimetry (at least on am and pm orbits, supplemented by a reference mission on a high-precision, inclined orbit)
o. Radio-occultation sounding (at least am and pm, supplemented by a constellation in specific orbits)
p. Broadband VIS/IR radiometer for Earth Radiation balance (at least am and pm)
q. Total Solar Irradiance (at least one)
r. Contribution to atmospheric composition observations (at least am and pm)
s. Narrow-band Vis/NIR imagers (at least one sun-synchronous, am spacecraft) for ocean colour, vegetation and aerosol monitoring
t. High-resolution multi-spectral Vis/IR imagers (constellation of sun-synchronous satellites, preferably in am)
u. IR dual-angle view imagery for high-accuracy SST (at least one am spacecraft)
v. Particle detection and / or electron density (at least am and pm)
w. Magnetic field (at least am and pm)
x. Solar activity (at least two)
y. Data collection

III. Other LEO missions

The following missions shall be performed on an operational basis by Low Earth Orbit satellites on appropriate orbits:

z. Ocean surface topography by radar altimetry (A reference mission on high-precision, inclined orbit, complementing two instruments on sun-synchronous am and pm orbit)
aa. Radio-Occultation sounding (dedicated constellation of sensors on appropriate orbits)

IV. Contingency Planning

The CGMS baseline is associated with contingency plans for geostationary and polar-orbiting satellite systems, which are detailed in the CGMS Global Contingency Plan[2].

V. Inter-calibration

Instruments should be inter-calibrated on a routine basis against reference instruments or calibration sites. The routine and operational intercalibration and corrections shall be performed in accordance with standards as agreed by the Global Space-based Inter-calibration System (GSICS).

VI. Data availability and dissemination

VI.1. Data open availability with suitable timeliness

All operational environmental observation satellite systems should be designed to ensure the provision of data with suitable timeliness, as appropriate for their intended applications. Data should be preserved for the long term and documented with metadata allowing their interpretation and utilisation. The satellite operators should establish dissemination contents and schedules that take into account the data requirements of users. Re-broadcast via telecommunication satellites should complement and supplement direct broadcast services, which allows cost-efficient access to integrated data streams including data from different satellites, non-satellite data and geophysical products. The dissemination systems should utilise all-weather resilient telecommunication means.

VI.2. Direct broadcast for core meteorological missions in LEO

The core meteorological satellite systems in LEO orbits, and other operational observation satellite systems when relevant, should ensure near-real-time data dissemination of imagery, sounding, and other real-time data of interest to Members by direct broadcast. Direct broadcast frequencies, modulations, and formats for polar-orbiting satellites should allow a particular user to acquire data from either satellite by a single antenna and signal processing hardware. Direct Broadcast should use allocations in all-weather resilient frequency bands.

VII. Note

The present update of the CGMS baseline is adopted in the light of satellite mission plans as they are known in October 2011.

[2] The Global Contingency Plan (http://www.wmo.int/pages/prog/sat/documents/CGMS_Global-Contingency-Plan_version2_070507.pdf) should be updated accordingly. It should indicate that in case of potential gaps on core sun-synchronous missions, absolute priority should be given to observation from mid-morning and early afternoon orbits, in order to maintain the continuity of these datasets

APPENDIX: GENERAL CGMS INFORMATION

1. CHARTER FOR CGMS

2. CGMS MEMBERSHIP

3. ADDRESSES FOR PROCURING ARCHIVE DATA

4. CONTACT LIST FOR OPERATIONAL ENGINEERING MATTERS

5. ADDRESS LIST FOR DISTRIBUTION OF CGMS DOCUMENTS

6. E-MAIL LIST SERVERS

7. GLOSSARY

CHARTER FOR THE COORDINATION GROUP FOR METEOROLOGICAL SATELLITES (CGMS) [3]

PREAMBLE

RECALLING that the Coordination on Geostationary Meteorological Satellites (CGMS) has met annually as an informal body since September 1972 when representatives of the United States (National Oceanic and Atmospheric Administration), the European Space Research Organisation (now the European Space Agency), and Japan (Japan Meteorological Agency) met to consider common interests relating to the design, operation and use of these agencies planned meteorological satellites,

RECALLING that the Union of Soviet Socialist Republics (State Committee for Hydrometeorology), India (India Meteorological Department) and the People's Republic of China (State Meteorological Administration) initiated development of geostationary satellites and joined CGMS in 1973, 1978, and 1986 respectively,

RECOGNISING that the World Meteorological Organisation (WMO) as a representative of the meteorological satellite data user community has participated in CGMS since 1974,

NOTING that the European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT) has, with effect from January 1987, taken over responsibility from ESA for the METEOSAT satellite system and the current Secretariat of CGMS,

CONSIDERING that CGMS has served as an effective forum through which independent agency plans have been informally harmonised to meet common mission objectives and produce certain compatible data products from geostationary meteorological satellites for users around the world,

RECALLING that the USA, the USSR, China and Europe have launched polar-orbiting meteorological satellites, and that the polar and geostationary meteorological satellite systems together form a basic element of the space based portion of the WMO Global Observing System,

BEING AWARE of the concern expressed by the WMO Executive Council Panel of Experts over the lack of guaranteed continuity in the polar-orbit and its recommendation that there should be greater cooperation between operational meteorological satellite operators world-wide, so that a more effective utilisation of these operational systems, through the coordination and standardisation of many services provided, can be assured,

RECOGNISING the importance of operational meteorological satellites for monitoring and detection of climate change,

RECOGNISING the expansion of the space-based component of the WMO's World Weather Watch Global Observing System to include Research & Development missions and the commitment of the National Aeronautics and Space Administration (NASA), European Space Agency (ESA), Russian Aviation and Space Agency (Rosaviakosmos) and the National Space Development Agency of Japan (NASDA) to make observations from its missions available to the world community at the 2nd session of the WMO Consultative Meetings on High Level Policy on Satellite matters in February 2002,

NOTING the expansion of CGMS at CGMS-31 to include NASA, ESA, Rosaviakosmos and the Japan Aerospace Exploration Agency (JAXA) as full members to improve coordination between operational meteorological and R & D satellite operators,

NOTING the further expansion of CGMS at CGMS-32 to include CNES, at CGMS-33 to include KMA, and at CGMS-34 to include CNSA, following to their commitment to make observations from their missions available to the world community in full adherence with the space-based component of the WMO's World Weather Watch Global Observing System,

AND RECOGNISING the need to update the purpose and objectives of CGMS,

AGREE

I. To change the name of CGMS to the Coordination Group for Meteorological Satellites

II. To adopt a Charter, establishing Terms of Reference for CGMS, as follows:

OBJECTIVES

a. CGMS provides a forum for the exchange of technical information on geostationary and polar-orbiting meteorological satellite systems and research & development missions, such

[3] This Charter was amended at CGMS-31 to take into account new membership of the R&D agencies ESA, NASA, JAXA and Rosaviakosmos. It was further amended at CGMS-34 to take into account the new membership of CNES (since CGMS-32), KMA (since CGMS-33), and CNSA.

as reporting on current meteorological satellite status and future plans, telecommunications matters, operations, intercalibration of sensors, processing algorithms, products and their validation, data transmission formats and future data transmission standards.

b. CGMS harmonises to the extent possible meteorological satellite mission parameters such as orbits, sensors, and data formats and downlink frequencies.
c. CGMS encourages complementarity, compatibility and possible mutual back-up in the event of system failure through cooperative mission planning, compatible meteorological data products and services and the coordination of space and data related activities, thus complementing the work of other international satellite coordinating mechanisms.

MEMBERSHIP

d. CGMS Membership is open to all operators of meteorological satellites, to prospective operators having a clear commitment to develop and operate such satellites, and to the WMO, because of its unique role as representative of the world meteorological data user community. Further CGMS Membership is open to space agencies operating R & D satellite systems that have the potential to contribute to WMO and supported programmes.
e. The status of observer will be open to representatives of international organisations or groups who have declared an intent, supported by detailed system definition studies, to establish a meteorological satellite observing system. Once formal approval of the system is declared, membership of CGMS can be requested by the observer. Within two years of becoming an observer, observers will report on progress being made towards the feasibility of securing national approval of a system. At that time CGMS Members may review the continued participation by each Observer.
f. The current Membership of CGMS is listed in Appendix 2 to this charter.
g. The addition of new Members and Observers will be by consensus of existing CGMS Members.

ORGANISATION

h. CGMS will meet in plenary session annually. Ad hoc Working Groups to consider specific issues in detail might be convened at the request of any Member provided that written notification is received and approved by the Membership at least 1 month in advance and all Members agree. Such Working Groups will report to the next meeting of CGMS.
i. One Member, on a voluntary basis, will serve as the Secretariat of CGMS.
j. Provisional meeting venues, dates and draft agenda for plenary meetings will be distributed by the Secretariat 6 months in advance of the meeting, for approval by the Members. An agreed Agenda will be circulated to each Member 3 months in advance of the meeting.
k. Plenary Meetings of CGMS will be chaired by each of the Members in turn, the Chairperson being proposed by the host country or organisation.
l. The Host of any CGMS meeting, assisted by the Secretariat, will be responsible for logistical support required by the meeting. Minutes will be prepared by the Secretariat, which will also serve as the repository of CGMS records. The Secretariat will also track action items adopted at meetings and provide CGMS Members with a status report on these and any other outstanding actions, four months prior to a meeting and again at the meeting itself.

PROCEDURE

m. The approval of recommendations, findings, plans, reports, minutes of meetings, the establishment of Working Groups will require the consensus of Members. Observers may participate fully in CGMS discussions and have their views included in reports, minutes etc., however, the approval of an observer will not be required to establish consensus.
n. Recommendations, findings, plans and reports will be non-binding on Members or Observers.
o. Once consensus has been reached amongst Members on recommendations, findings, plans and reports, minutes of meetings or other such information from CGMS, or its Working Groups, this information may be made publicly available.
p. Areas of cooperation identified by CGMS will be the subject of agreement between the relevant Members.

COORDINATION

q. The work of CGMS will be coordinated, as appropriate, with the World Meteorological Organisation and its relevant bodies, and with other international satellite coordination mechanisms, in particular the Committee on Earth Observation Satellites (CEOS) and the Earth Observation International Coordination Working Group (EO-ICWG) and the Space Frequency Coordination Group (SFCG).

Organisations wishing to receive information or advice from the CGMS should contact the Secretariat; which will pass the request on to all Members and coordinate an appropriate response, including documentation or representation by the relevant CGMS Members.

AMENDMENT

r. These Terms of Reference may be amended or modified by consensus of the Members. Proposals for amendments should be in the hands of the Members at least one month prior to a plenary meeting of CGMS.

EFFECTIVE DATE AND DURATION

s. These Terms of Reference will become effective upon adoption by consensus of all CGMS Members and will remain in effect unless or until terminated by the consensus of CGMS Members.

MEMBERSHIP OF CGMS

The current Membership of CGMS is:

CMA	joined 1989
CNES	joined in 2004
CNSA	joined in 2006
ESA	re-joined in 2003
EUMETSAT	joined 1987 (currently CGMS Secretariat)
IMD	joined 1979
IOC/UNESCO	joined in 2001
JAXA	joined in 2003
JMA	founder member, 1972
KMA	joined in 2005
NASA	joined in 2003
NOAA	founder member, 1972
ROSCOSMOS	joined in 2003
ROSHYDROMET	joined 1973
WMO	joined 1973

In some cases delegates are supported by other Agencies, for example SRC Planeta (with Roshydromet), and ISRO (with IMD).

ADDRESSES FOR PROCURING ARCHIVE DATA

CMA
Mr Anlai SUN
National Satellite Meteorological Center
China Meteorological Administration
46 Zhong Guan Cun South Ave.
Beijing, 100081
People's Republic of China
E-mail: Sunal (at) cma.gov.cn
http://www.cma.gov.cn/

EUMETSAT
Dr Volker Gärtner
Head of User Service
EUMETSAT
Eumetsat-Allee 1
D-64295 Darmstadt
Germany
E-mail: volker.gaertner (at) eumetsat.int
http://www.eumetsat.int/

IMD
Dr V. Rajeshwar Rao
Scientist E
Satellite Meteorology Division
India Meteorological Department
Lodhi Road
New Delhi 110003
+91 11 24 64 2249
+91 98 1843 3969
E-mail: rraovaddi@yahoo.com
http://www.imd.gov.in/

JAPAN- JMBSC
Japan Meteorological Business Support Center
3-17 Kanda Nishiki-cho
Chiyoda-ku
Tokyo 101-0054
Japan
http://www.jmbsc.or.jp/

NOAA
Mr Axel Graumann
Satellite Services Group
National Climatic Data Center
Room 120
151 Patton Avenue
Asheville, North Carolina 28801-5001
USA
Tel.: +1 828-271-4850,
Fax: +1 828-271-4876
E-mail: ncdc.satorder (at) noaa.gov
http://www.noaa.gov/

ROSCOSMOS
Dr Nina Novikova
Russian Space Device Institute
Research Center for Earth Operative Monitoring
82, Building 25, Dekabzistov St.
127490 Moscow, Russia
E-mail: novikova (at) ntsomz.ru
http://www.rosaviakosmos.ru

ROSHYDROMET/SRC PLANETA
Prof Vasily Asmus
Director
SRC Planeta
B. Predtechenskylisty Per. 7
123242 Moscow
Russia
Tel.: +7 499 252 3717,
Fax: +7 499 252 6210
E-mail: asmus (at) planet.iitp.ru

CONTACT LIST FOR OPERATIONAL ENGINEERING MATTERS

CMA

Mr Xu Jianmin
Member of Chinese Academy of Engineering
Satellite Meteorological Center
China Meteorological Administration
46 Zhong Guan Cun South Ave.,
Beijing, 100081, People's Republic of China
Tel: +86 10 68406367
Fax: +86 10 6217 2724
E-mail: xujm (at) cma.gov.cn
http://www.cma.gov.cn/

Dr Yang Jun
Director-General
National Satellite Meteorological Center
China Meteorological Administration
46 Zhong Guan Cun South Ave.,
Beijing, 100081, People's Republic of China
Tel.: +86 10 6840 7108
Fax: +86 10 6217 2724
E-mail: junyang (at) cma.gov.cn
http://www.cma.gov.cn/

EUMETSAT

Mr Mikael Rattenborg
Director of Operations
EUMETSAT
Eumetsat-Allee 1
D-64295 Darmstadt, Germany
Tel.: +49 6151 807-3680
Fax: +49 6151 807 3040
E-mail: mikael.rattenborg (at) eumetsat.int
http://www.eumetsat.int/

IMD

Dr V. Rajeshwar Rao
Scientist E
Satellite Meteorology Division
India Meteorological Department
Lodhi Road
New Delhi 110003
+91 11 24 64 2249
+91 98 1843 3969
E-mail: rraovaddi@yahoo.com
http://www.imd.gov.in/

JAXA

Mr Kazuo Umezawa
Engineer,
Earth Observation Research Center (EORC), Space Applications Mission Directorate
Japan Aerospace Exploration Agency (JAXA)
2-1-1 Sengen, Tsukuba, Ibaraki, 305-8505, Japan
Tel.: +8150 3362 2669
Fax: +8129 868 2961
E-mail: umezawa.kazuo (at) jaxa.jp
http://www.jaxa.jp/index_e.html

JMA/MSC

Mr Yoshihiko Tahara
Head of System Engineering Division
Meteorological Satellite Center (MSC)
Japan Meteorological Agency (JMA)
3-235 Nakakiyoto, Kiyose-shi
Tokyo 204-0012 , Japan
Tel.: +81 42 493 4970
Fax: +81 42 492 2433
E-mail: cgmsplen (at) dpc.kishou.go.jp
http://mscweb.kishou.go.jp/index.htm

NOAA

Mr Gary Davis
Director, Office of Satellite Operations and Systems Development
NOAA/NESDIS
SSMC1, Room 6234
1335 East/West Highway
Silver Spring, Maryland, 20910, USA
Tel: +1 301 713 0100
Fax: +1 301 713 3599
E-mail: gary.davis (at) noaa.gov
http://www.noaa.gov/

Dr Suzanne Hilding
Deputy Director, Office of Satellite Operations and Systems Development
NOAA/NESDIS
SSMC1, Room 6234
1335 East/West Highway
Silver Spring, Maryland, 20910, USA
Tel: +1 301 713 0100
Fax: +1 301 713 3599
E-mail: suzanne.hilding (at) noaa.gov
http://www.noaa.gov/

ROSHYDROMET/SRC PLANETA

Mrs Tatjana Bourtseva
SRC Planeta
7, Bolshoy Predtechensky Per.
Moscow, 123242, Russia
Tel: +7 499 795 2421
Fax: +7 499 252 6210
E-mail: burc (at) planet.iitp.ru

ADDRESS LIST FOR THE DISTRIBUTION OF CGMS DOCUMENTS

CGMS Secretariat EUMETSAT
Ms Anne Taube
Strategy and International Relations
Eumetsat-Allee 1
64295 Darmstadt, Germany
Tel: +49 6151 807-5190
Fax: +49 6151 807-8150
E-mail: anne.taube (at) eumetsat.int
E-mail: cgmssec (at) eumetsat.int
http://www.eumetsat.int/

CMA
Mr Yang Jun
Director General
National Satellite Meteorological Center
China Meteorological Administration
No. 46 Zhongguancun South Avenue, Haidian
Beijing, 100081
People's Republic of China
Tel: +86 10 6840 7108
Fax: +86 10 6217 2724
E-mail: junyang (at) cma.gov.cn
http://www.cma.gov.cn/

Mr Xu Jianmin
Member of Chinese Academy of Engineering
No. 46 Zhongguancun South Avenue, Haidian
Beijing, 100081
People's Republic of China
Tel: +86 10 6840 6367
Fax: +86 10 6217 2724
E-mail: xujm (at) cma.gov.cn
http://www.cma.gov.cn/

Mr Luo Dongfeng
International Cooperation Department
National Satellite Meteorological Center
China Meteorological Administration
No. 46 Zhongguancun South Avenue, Haidian
Beijing, 100081
People's Republic of China
Tel: +86 10 6840 6877
Fax: +86 10 6217 2724
E-mail: luodf (at) cma.gov.cn
wsk (at) cma.gov.cn
http://www.cma.gov.cn/

CNES
Mrs Pascale Ultré-Guérard
Head of Earth Observation Programmes
CNES
2, place Maurice Quentin
F-75039 Paris Cedex 01
France
Tel.: +33 1 44 76 75 33
Fax:+33 1 44 76 78 67
E-mail: pascale.ultre-guerard (at) cnes.fr

CNES continued
Mr Didier Renaut
Responsible for Meteorological Atmosphere and Climate
2 place Maurice Quentin
F-75039 Paris Cedex 01
France
Tel.: +33 1 44 76 78 10
Fax : +33 1 44 76 78 67
E-mail: didier.renaut (at) cnes.fr

Mr Jean Pla
Bureau des Fréquences / Spectrum management
Centre National d'Etudes Spatiales
18 Avenue Edouard Belin
31401 Toulouse Cedex 9, France
Tel + 33 5 61 28 20 59
Fax + 33 5 61 28 15 74
mob + 33 6 71 60 03 14
e-mail jean.pla (at) cnes.fr

CNSA
Mr Lai Yan Sun
Administrator
China National Space Administration
8A Fucheng Road
Haidian District
Beijing 100037, China
Tel.: +86 108858 1377/1379
Fax: +86 10 88 58 13 69/1515
Email: cnsa (at) cnsa.gov.cn
http://www.cnsa.gov.cn/main_e.asp

Mr Gao Jun
China National Space Administration
8A Fucheng Road
Haidian District,
Beijing 100037, China
Tel.: +86 10 88 58 1455
Fax: +86 10 88 58 1530
Email: gaojun (at) cnsa.gov.cn

ESA
Dr Stephen Briggs
Head of Earth Observation Science and Applications Department
EOP-S, ESA/ESRIN
Via Galileo Galilei
I-00044 Frascati (Rome), Italy
Tel: +39 06 94180 400
Fax: +39 06 941 80402
E-mail: Stephen.Briggs (at) esa.int
www.esa.int

ESA continued

Mr Ivan Petiteville
Coordination Office
Directorate of Earth Observation Programmes ESRIN
Via Galileo Galilei, CP 64
I-00044 Frascati, Italy
Tel: +39 0694180 567
Fax: +39 0694180 353
E-mail: Ivan.Petiteville (at) esa.int
www.esa.int

EUMETSAT

Mr Paul Counet
Head of International Relations, EUMETSAT
Eumetsat-Allee 1
64295 Darmstadt, Germany
Tel: +49 6151 807 6030
Fax: +49 6151 807-8660
E-mail: paul.counet (at) eumetsat.int
http://www.eumetsat.int/

Dr Volker Gärtner
Head of User Service, EUMETSAT
Eumetsat-Allee 1
64295 Darmstadt, Germany
Tel: +49 6151 807 5830
Fax: +49 6151 807-3040
E-mail: volker.gaertner (at) eumetsat.int
http://www.eumetsat.int/

Mr Mikael Rattenborg
Director of Operations, EUMETSAT
Eumetsat-Allee 1
64295 Darmstadt, Germany
Tel: +49 6151 807-3680
Fax: +49 6151 807-3040
E-mail: mikael.rattenborg (at) eumetsat.int
http://www.eumetsat.int/

Mr Alain Ratier
Director-General, EUMETSAT
Eumetsat-Allee 1
64295 Darmstadt, Germany
Tel: +49 6151 807-6000
Fax: +49 6151 807-8300
E-mail: alain.ratier (at) eumetsat.int
http://www.eumetsat.int/

Dr Johannes Schmetz
Head of Meteorological Division, EUMETSAT
Eumetsat-Allee 1
64295 Darmstadt, Germany
Tel: +49 6151 807-5900
Fax: +49 6151 807-8380
E-mail: johannes.schmetz (at) eumetsat.int
http://www.eumetsat.int/

Mr Ernst Koenemann
Director of Programme Development, EUMETSAT
Eumetsat-Allee 1
64295 Darmstadt, Germany
Tel: +49 6151 807-5000
Fax: +49 6151 807-5520
E-mail: ernst.koenemann (at) eumetsat.int
http://www.eumetsat.int/

Mr Joaquin Gonzalez
Ground Segment System Engineering Support Manager, EUMETSAT
Eumetsat-Allee 1
64295 Darmstadt, Germany
Tel: +49 6151 807-5750
Fax: +49 6151 807-4260
E-mail: joaquin.gonzalez (at) eumetsat.int
http://www.eumetsat.int/

Mr Gordon Bridge
Training support officer, EUMETSAT
Eumetsat-Allee 1
64295 Darmstadt, Germany
Tel: +49 6151 807-5410
Fax: +49 6151 807-3040
E-mail: gordon.bridge (at) eumetsat.int
http://www.eumetsat.int/

IOC/UNESCO

Dr. Albert Fischer
GOOS project office director and Head of the Ocean Observations and Services Section at IOC
1, rue Miollis
F-75732 Paris Cedex 15
Tel.: +33 1 45 68 40 42
Fax: +33 1 45 68 58 13
E-mail: a.fischer (at) unesco.org
http://ioc.unesco.org/iocweb/index.php

Dr. David Halpern
NASA Headquarters
300 E Street SW
Washington, DC 20546
USA
Tel: +1 202 358 1109
Email: david.halpern (at) nasa.gov

Prof Dr Hiroshi Kawamura
Center for Atmospheric and Ocean Studies
Graduate School of Science
Tohoku University
Sendai, 980 8578
Japan
Tel.: +81 22 217 6745
Fax: +81 22 217 6748
E-mail: kamu (at) ocean.caos.tohoku.ac.jp
http://ioc.unesco.org/iocweb/index.php

IMD
Dr Ajit Tyagi
Director General of Meteorology
India Meteorological Department
Mausam Bhavan, Lodi Road
New Delhi, 110003, India
Tel: +91 011 246 11842
Fax: +91 011 246 11792/23220/99216
E-mail: ajit.tyagi (at) gmail.com
http://www.imd.gov.in/

Dr Ashok Kumar Sharma
Dy Director General, Satellite Meteorology
India Meteorological Department
Lodi Road, 110003 New Delhi, India
Tel: +91 11-2462 6021
Fax: +91 11-2464 2249
E-mail aksimd (at) hotmail.com
http://www.imd.gov.in/

Dr Om Prakash SINGH
Scientist-F
Satellite Meteorology and Research
India Meteorological Department
Lodi Road, 110003 New Delhi, India
Tel: +91 11-2469 8247
Fax: +91 11-2464 2249
E-mail singh.op@imd.gov.in
http://www.imd.gov.in

Virendra Singh
Director
Satellite Meteorology Division
India Meteorological Department
Lodhi Road, New Delhi 110003
Tel +91 11-24642249
E-mail: vsvsingh69 (at) gmail.com
http://www.imd.gov.in/

JAXA
Dr Masanori Homma
Executive Director, Space Applications Mission Directorate
Japan Aerospace Exploration Agency
2-1-1, Sengen, Tsukuba, Ibaraki 305-8505, Japan
Tel.: +8150 3362 6705
Fax: +81 29 868 5963
E-mail: homma.masanori (at) jaxa.jp
http:// http://www.jaxa.jp/index_e.html

JAXA continued
Mr Makoto Kajii
Senior Chief Officer for International Cooperation,
Space Applications Mission Directorate
Japan Aerospace Exploration Agency
Marunouchi Kitaguchi Building, 1-6-5 Marunouchi,
Chiyoda-ku, Tokyo 100-8260, Japan
Tel: +8150 3362 6014
Fax: +813 6266 6901
E-mail: kajii.makoto (at) jaxa.jp
http://www.jaxa.jp/index_e.html

JMA/MSC
Mr Tatsuo Ueno
Director-General
Meteorological Satellite Center (MSC)
Japan Meteorological Agency (JMA)
3-235 Nakakiyoto, Kiyose-shi
Tokyo 204-0012, Japan
Tel: +81 424 934990
Fax: +81 424 922433
E-mail: cgmsplen (at) dpc.kishou.go.jp
http://mscweb.kishou.go.jp/index.htm

Mr Hiroshi Kunimatsu
Senior Scientific Officer
System Engineering Division,
Data Processing Department
Meteorological Satellite Center (MSC)
Japan Meteorological Agency (JMA)
3-235 Nakakiyoto, Kiyose-shi
Tokyo 204-0012, Japan
Tel.: +81 42 493 4973
Fax: +81 42 492 2433
E-mail: cgmsplen (at) dpc.kishou.go.jp
cgmsplen (at) met.kishou.go.jp
http://mscweb.kishou.go.jp/index.htm

JMA
Mr Tsutomu Jomura
Director, Satellite Program Division
Observations Department
Japan Meteorological Agency (JMA)
1-3-4 Ote-machi Chiyoda-ku
Tokyo 100-8122, Japan
Tel: +81 3 3201 8677
Fax: +81 3 3217 1036
E-mail: jomura (at) met.kishou.go.jp
http://www.jma.go.jp/jma/indexe.html

JMA continued

Mr Osamu Hamada
Senior Scientific Officer
Satellite Program Division
Observations Department
Japan Meteorological Agency (JMA)
1-3-4 Ote-machi Chiyoda-ku
Tokyo 100-8122, Japan
Tel: +81 3 3201 8677
Fax: +81 3 3217 1036
E-mail: cgmsplen (at) dpc.kishou.go. http://www.jma.go.jp/jma/indexe.html

Ms Keiko Yamamoto
Technical Officer
Satellite program Division
Observations Department
Japan Meteorological Agency (JMA)
1-3-4 Ote-machi Chiyoda-ku
Tokyo 100-8122, Japan
Tel: +81 3 3201 8677
Fax: +81 3 3217 1036
E-mail: cgmsplen (at) dpc.kishou.go.jp
http://www.jma.go.jp/jma/indexe.html

KMA

Dr Ae-Sook Suh
Director-General, National Meteorological Satellite Center
Korea Meteorological Administration
San 25-168, Gwanghewon-myeon,, Jincheon-gun,
Chungcheongbuk-do, 365-831, Republic of Korea
Tel.: +82 43 717 0202
Fax: +82 43 717 0210
E-mail: assuh (at) kma.go.kr

Dr Myoung-Hwan Ahn
Director, Satellite Development and Planning Division,
National Meteorological Satellite Center
Korea Meteorological Administration
San 25-168, Gwanghewon-myeon,, Jincheon-gun,
Chungcheongbuk-do, 365-831, Republic of Korea
Tel.: +82 43 717 0211
Fax: +82 43 717 0210
E-mail: mhahn (at) kma.go.kr

Dr Dohyeong Kim
Senior Researcher
National Meteorological Satellite Center
Korea Meteorological Administration
San 25-168, Gwanghewon-myeon,, Jincheon-gun,
Chungcheongbuk-do, 365-831, Republic of Korea
Tel.: +82 43 717 0222
Fax: +82 43 717 0210
E-mail: dolong (at) korea.kr

KMA continued

Dr Bongju Lee
Deputy Director
National Meteorological Satellite Center
Korea Meteorological Administration
San 25-168, Gwanghewon-myeon,, Jincheon-gun,
Chungcheongbuk-do, 365-831, Republic of Korea
Tel.: +82 43 717 0242
Fax: +82 43 717 0210
E-mail: b.lee (at) korea.kr

NASA

Dr Shahid Habib
Chief
Office of Science Utilization, Code 604
Science and Exploration Directorate
National Aeronautics and Space Administration
Goddard Space Flight Center Greenbelt
Maryland 20771 USA
Tel.: +1 301 614 5392
Fax: +1 301 614 5620
E-mail: shahid.habib-1 (at) nasa.gov
http://www.nasa.gov

Ms Devon Fleming
National Aeronautics and Space Administration
300 E Street SW Code Y
Washington, D.C., 20546-0001
USA
Tel.: +1 202 358 1622
Fax: +1 202 358 2798
E-mail: devon.c.fleming (at) nasa.gov
http://www.nasa.gov

Mr Michael S. Cisewski
MS475
NASA Langley Research Center
Hampton
Virginia, 23681
USA
Tel.: 1-757 864 1861
Fax: 1-757 864 2671
Email: m.s.cisewski (at) Larc.nasa.gov
http://www.nasa.gov

Dr Jack Kaye
NASA HQ
300 E Street SW
Washington, D.C., 20546-0001
USA
E-mail: jack.kaye (at) nasa.gov
http://www.nasa.gov

NASA continued

Dr Ramesh Kakar
NASA, HQ
600 Independance Avenue, South-West
Washington, DC, 20546
USA
E-mail: ramesh.kakar (at) nasa.gov
http://www.nasa.gov

NOAA

Mr Gary Davis
Director, Office of Satellite Operations and Systems Development
NOAA/NESDIS
SSMC1, Room 6234
1335 East/West Highway
Silver Spring, Maryland, 20910, USA
Tel: +1 301 713 0100
Fax: +1 301 713 3599
E-mail: gary.davis (at) noaa.gov
http://www.noaa.gov/

Dr Suzanne Hilding
Deputy Director, Office of Satellite Operations and Systems Development
NOAA/NESDIS
SSMC1, Room 6234
1335 East/West Highway
Silver Spring, Maryland, 20910, USA
Tel: +1 301 713 0100
Fax: +1 301 713 3599
E-mail: suzanne.hilding (at) noaa.gov
http://www.noaa.gov/

Dr Mitch Goldberg
Deputy Director, Office of Research and Applications
NOAA/NESDIS
5200 Auth Road
Camp Springs, Maryland, 20746-4304, USA
Tel.: +1 301 763 8078 ext 125
Fax.: +1 301 763 8580
E-mail: mitch.goldberg (at) noaa.gov
http://www.noaa.gov/

Mr Derek Hanson
International & Interagency Affairs Office
NOAA/NESDIS (E/IA1)
SSMC1, Room 7311
1335 East-West Highway
Silver Spring, Maryland 20910, USA
Tel: +1 301 713 2024 Ext. 213
Fax: +1 301 713 2032
E-mail: Derek.hanson (at) noaa.gov
http://www.noaa.gov/

NOAA continued

Mr Marlin O. Perkins
NOAA/NESDIS
NSOF, Room 1640, E/SP3
4231 Suitland Road
Suitland, Maryland, 20746
USA
Tel.: +1 301-817-4523
Fax.: +1 301 817-4569
E-mail: marlin.o.perkins (at) noaa.gov
http://www.noaa.gov/

Mr Charles Wooldridge
International & Interagency Affairs Office
NOAA/NESDIS (E/IA1)
SSMC1, Room 7311
1335 East-West Highway
Silver Spring, Maryland 20910, USA
Tel: +1 301 713 0813
Fax: +1 301 713 2032
E-mail: charles.wooldrige (at) noaa.gov
http://www.noaa.gov/

ROSCOSMOS

Mr Valery Ermakov
Deputy Head of Division
Federal Space Agency (ROSCOSMOS)
Shepkina Str. 42
107996 Moscow
Tel: + 7 495 631 97 52
Fax: + 7 495 631 94 20
E-mail: perova (at) roscosmos.ru
http://www.roscosmos.ru

Mr Mikhail Khaylov
Deputy Head of Department
Federal Space Agency (ROSCOSMOS)
Shepkina Str. 42
107996 Moscow
Tel: + 7 495 631 92 24
Fax: + 7 499 975 47 38
E-mail: perova (at) roscosmos.ru
http://www.roscosmos.ru

Dr Victor Selin
Chief, Dept. of Automatical Satellite Systems
Federal Space Agency (ROSCOSMOS)
Shepkina Str. 42
107996 Moscow
Tel.: +7495 631 9895
Fax: +7499 975 47 38
E-mail: perova (at) roscosmos.ru
http://www.roscosmos.ru

ROSCOSMOS/TSNIIMASH

Mr Dimitriy Kozeev
Federal Space Agency ROSCOSMOS/TSNIIMASH
Pionerskaya Str. 4
141070 Korolev, Moscow Region
Russia
Tel.: +7495 513 4291
Fax: +7495 513 4393
E-mail: astashkin (at) tsniimash.ru
http://www.tsniimash.ru

ROSHYDROMET

Mr Alexander Nurullaev
Chief/International Coop. Dept.
Russian Federal Service for Hydrometeorology and Environmental Monitoring
Novovagan'kovsky Street, 12
123242 Moscow, RUSSIA
Tel: +7 499 252 3873
Fax: +7 499 252 5504
Email: umc (at) mecom.ru

Mr Alexandr I. Gusev
Russian Federal Service for Hydrometeorology and Environmental Monitoring
Novovagan'kovsky Street, 12
123242 Moscow, RUSSIA
Tel: +7 499 252 4813
Fax: +7 499 795 2115

Dr Valery N. Dyadyuchenko
Deputy Head, Russian Federal Service for Hydrometeorology & Environmental Monitoring
Novovagan'kovsky Street, 12
123242 Moscow, RUSSIA
Tel: +7 499 255 1935
Fax: +7 499 795 2207
E-mail: dvn (at) mecom.ru

ROSHYDROMET/SRC PLANETA

Prof Vasily V. Asmus
Director, State Research Center (SRC) Planeta
7, Bolshoy Predtechensky Per.
Moscow, 123242, Russia
Tel: +7 499 252 37 17
Fax: +7 499 252 62 10
E-mail: asmus (at) planet.iitp.ru

Dr Oleg Milekhin
Deputy Director, SRC Planeta
7, Bolshoy Predtechensky Per.
Moscow, 123242, Russia
Tel: +7 499 255 97 49
Fax: +7 499 252 62 10
E-mail: milekhin (at) planet.iitp.ru

ROSHYDROMET/SRC PLANETA continued

Dr Victor Saulskiy
Chief, Department of Remote Sensing Satellite Systems SRC Planeta
7, Bolshoy Predtechensky Per.
Moscow, 123242, Russia
Tel: +7 495 605 21 06
Fax: +7 499 252 62 10
E-mail: saulskiy (at) planet.iitp.ru

WMO

Dr Wenjian Zhang
Director
WMO Observing and Information Systems Department
7 bis Avenue de la Paix
Case Postale 2300
CH-1211 Geneva 2, Switzerland
Tel: +41 22 730 8567
Fax: +41 22 730 8181
E-mail: wzhang (at) wmo.int
http://www.wmo.int/index-en.html

Ms Barbara J. Ryan
Director
WMO Space Programme Office
7 bis Avenue de la Paix
Case Postale 2300
CH-1211 Geneva 2, Switzerland
Tel: +41 22 730 8285
Fax: +41 22 730 8181
E-mail: bryan (at) wmo.int
http://www.wmo.int/index-en.html

Mr Jérôme Lafeuille
Chief, Space-based Observing System
WMO Space Programme Office
7 bis Avenue de la Paix
Case Postale 2300
CH-1211 Geneva 2, Switzerland
Tel: +41 22 730 8228
Fax: +41 22 730 8181
E-mail: jlafeuille (at) wmo.int
http://www.wmo.int/sat

Dr Stephan Bojinski
Satellite Utilisation Division
WMO Space Programme Office
WMO, 7 bis Avenue de la Paix
Case Postale 2300
CH-1211 Geneva 2, Switzerland
Tel: +41 22 730 8228
Fax: +41 22 730 8181
E-mail: sbojinski (at) wmo.int
http://www.wmo.int/sat

OBSERVERS

KARI
Dr Myung-Jin Baek
Principal Researcher
COMS Program Office, Korea Aerospace Research Institute
45, Eoeun-Dong, Youseong-Gu, Daejeon, 305-333,
Republic of Korea
Tel.: +82-42-860-2346
Fax: +82-42-860-2603
E-mail: mjbaek (at) kari.re.kr

Mr Heong-Sik Youn
COMS Payload Program Manager
Korea Aerospace Research Institute
COMS Program Office
45, Eoeun-Dong, Youseong-Gu, Daejeon, 305-333,
Republic of Korea
Tel.: +82-42-860-2396
Fax: +82-42-860-2568
E-mail: youn (at) kari.re.kr

KORDI
Dr Chan-Su Yang
Ocean Satellite Research Group Senior Researcher
Korean Ocean Research & Development Institute
Ansan PO Box 29
Seoul 425-600
Republic of Korea
Tel.: +82-31-400-7678
Fax: +82-31-400-7606
E-mail: yancs (at) kordi.re.kr

CEOS WGCV
Mr Pascal Lecomte
Chair, CEOS Working Group on Calibration and Validation
ESA/ESRIN
Via Galileo Galilei, CP 64
00044 Frascati
Italy
Tel +39-06 94 180 670
Tel +39-06 94 180 612
E-mail pascal.lecomte (at) esa.int
www.esa.int
www.ceos.org

ISRO
Dr R R Navalgund
Director
Space Applications Centre
Ahmedabad 380015
India
Tel: +91 79 26913344
Fax: +91 79 26915843
E-mail: director (at) sac.isro.gov.in

ISRO
Dr Pradip K Pal
Group Director
Meteorology and Oceanography Group
Space Applications Centre
Ahmedabad 380015
India
Tel: +91 79 26916044
Fax: +91 79 26916075
E-mail: pkpal25 (at) hotmail.com

E-MAIL LIST SERVERS

CGMS Plenary

(Last update 9 November 2011)

*csr (at)wmo.int

BC:

AHN Myoung-Hwan	mhahn (at)kma.go.kr
ASMUS Vasily	asmus (at)planet.iitp.ru
BAEK Myung-Jin	mjbaek (at)kari.re.kr
BAEVA Elena[6]	space (at)mcc.mecom.ru
BELYAEV Alexander[4]	alexnur (at)mcc.mecom.ru
BIZZARRI Bizzarro	bibizzar (at)tin.it
BOGDANOV Vladimir[6]	space (at)mcc.mecom.ru
BOJINSKI Stephan	sbojinski (at)wmo.int
BONADONNA Michael	Michael.Bonadonna (at)noaa.gov
BRAUER Douglas	Douglas.Brauer (at)noaa.gov
BRIDGE Gordon	Gordon.bridge (at)eumetsat.int
BRIGGS Stephen	Stephen.Briggs (at)esa.int
BRULE Luc	Luc.Brule (at)asc-csa.gc.ca
CAO Hayiyi	haiyicao (at)163.net
CHO Seok Joon	pb_int (at)kma.go.kr
CHUNG Sung-Rae	csr (at)kma.go.kr
CISEWSKI Michel	m.s.cisewski (at)Larc.nasa.gov
CNSA (group email) (Mr Lai Yan Sun)	cnsa (at)cnsa.gov.cn
COMERFORD Rowanna	rowanna.comerford (at)eumetsat.int
COUNET Paul	paul.counet (at)eumetsat.int
DANZ Andrea	andrea.danz (at)eumetsat.int
DAVIS Gary	gary.davis (at)noaa.gov
D'ESCATHA Yannick	yannick.d-escatha (at)cnes.fr
DYADUCHENKO Valery	dvn (at)mecom.ru
ELLIOTT Simon	simon.elliott (at)eumetsat.int
ERMAKOV Valery[1]	perova (at)roscosmos.ru
FELLOUS Jean-Louis	jfellous (at)noos.fr
FISCHER Albert	a.fischer (at)unesco.org
FLEMING DeVon	devon.c.fleming (at)nasa.gov
GAIROLA Rakesh	rmgairola (at)gmail.com
GAO Jun	gaojun (at)cnsa.gov.cn
GÄRTNER Volker	volker.gaertner (at)eumetsat.int
GETKIN Yuriy	dzz (at)rniikp.ru
GIRI RK	Rk_giri (at)yahoo.com
GOHIL Bhawani Singh	bsgohil (at)sac.isro.gov.in
GOLDBERG Mitch	Mitch.Goldberg (at)noaa.gov
GONZALEZ Joaquin	joaquin.gonzalez (at)eumetsat.int
GOROBETS Dmitriy[3]	unmc (at)mcc.mecom.ru
GOYAL Suman	suman_goyal61 (at)yahoo.co.in
HABIB Shahid	shahid.habib-1 (at)nasa.gov
HALPERN David	David.halpern (at)nasa.gov
HAMADA Osamu	o-hamada (at)met.kishou.go.jp
HANSON Derek	Derek.Hanson (at)noaa.gov
HARDING Todd	Todd.Harding (at)noaa.gov
HEDGE V.S	Vshedge (at)isro.gov.in
HILDING Suzanne	suzanne.hilding (at)noaa.gov
HORIKAWA Yasushi	horikawa.yasushi (at)jaxa.jp
HURST Kimberly	kimberly.hurst (at)noaa.gov
IGARASHI Tamotsu	igarashi.tamotsu (at)jaxa.jp
IZUMIKAWA Yasushi	y-izumikawa (at)met.kishou.go.jp
JANG Jae-Dong	jaedongjang (at)korea.kr
JMA (group e-mail)	cgmsplen (at)dpc.kishou.go.jp
JMA international exchange of CGMS plenary matters	kokusai (at)dpc.kishou.go.jp
JOSHI Prakash Chandra	pcjoshi (at)sac.isro.gov.in
JUN Gao	gaojun8858 (at)sina.com
KAJII Makoto	kajii.makoto (at)jaxa.jp
KAKAR Ramesh	ramesh.k.kakar (at)nasa.gov
KAWAMURA Hiroshi	kamu (at)ocean.caos.tohoku.ac.jp
KAYE Jack	jack.kaye (at)nasa.gov
KHAYLOV Mikhail[1]	perova (at)roscosmos.ru; mnh (at) inbox.ru
KILLOUGH Brian D	brian.d.killough (at)nasa.gov
KIM Dohyeong	dkim (at)korea.kr; dolong (at)korea.kr
KOENEMANN Ernst	ernst.koenemann (at)eumetsat.int
KOSAKA Yuki	Yuki-kosaka (at)met.kishou.go.jp
KROUPNIK Guennadi	Guennadi.Kroupnik (at)asc-csa.gc.ca
KUNIMATSU Hiroshi	kunimatsu (at)met.kishou.go.jp
KURINO Toshiyuki	tkurino (at)met.kishou.go.jp
LABENETS Tatiana	laben (at)mcc.mecom.ru
LAFEUILLE Jerome	JLafeuille (at)wmo.int
LECOMTE Pascal	pascal.lecomte (at)esa.int
LEE Bongju	b.lee (at)korea.kr
LI Guoping	guoping530 (at)yahoo.com.cn
LU Feng	lufeng (at)cma.gov.cn

*Includes CGMSFREQ list

[1] same email address for four persons
[2] same email address for two persons
[3] same email address for six persons
[4] same email address for two persons
[5] same email address for two persons
[6] same email address for two persons

LUBCHENKO Fedor	FedorNL (at)yandex.ru
LUO Dongfeng	dfluo (at)nsmc.cma.gov.cn, luodf (at)cma.gov.cn, wsk (at)cma.gov.cn
MALIK Dinesh Kumar	dk_malik (at)hotmail.com
MANORE Michael J	Mike.Manore (at)ec.gc.ca
MARING Hal	hal.maring (at)nasa.gov
MARTYNOV Alexander[3]	unmc (at)mcc.mecom.ru
MATHUR Aloke Kumar	alokemathur (at)sac.isro.gov.in
MENG Qing-yan	mqy (at)irsa.ac.cn;
MILEKHIN Oleg	milekhin (at)planet.iitp.ru
MITRA Ashim[5]	ashimmitra (at)gmail.com
MM Ali	mmali73 (at)yahoo.com
MOSKATINIEV Ivan[3]	unmc (at)mcc.mecom.ru; miv (at) laspace.ru
MULLER Daniel	Daniel.Muller (at)noaa.gov
NAVALGUND	Director (at)sac.isro.gov.in
NOSENKO Yuriy[3]	unmc (at)mcc.mecom.ru
NOVIKOV Mikhail	vniiem (at)vniiem.ru
NOVIKOVA Nina	ntsomz (at)ntsomz.ru
NURULLAEV Alexander[4]	alexnur (at)mcc.mecom.ru
OU Mi-Lim	milim (at)korea.kr
PAL Pradip Kumar	pradip (at)sac.isro.gov.in
PANGASA N K	Nk.pangasa (at)imd.gov.in, pangasank (at)hotmail.com
PANG Jing	pangjing (at)cma.gov.cn
PARK Jeong-Hyun	pjh21 (at)kma.go.kr
PARK Se-Kyoung	sekpark (at)i-art.co.kr
PERKINS Marlin	marlin.o.perkins (at)noaa.gov
PETITEVILLE Ivan	Ivan.Petiteville (at)esa.int
PLA Jean	jean.pla (at)cnes.fr
POPOVKIN A Vladimir[1]	perova (at)roscosmos.ru
PUVIARASAN N	puvi4 (at)yahoo.com
RAJAGOPALAN Ramakrisnan	rama (at)sac.isro.gov.in
RAJU Kama	kamaraju (at)isro.gov.in
RAO Madhusudan	bmrao99 (at)hotmail.com
RAO RAJESWARA Vaddi[2]	rraovaddi (at)yahoo.com, rraovaddi (at)gmail.com
RATIER Alain	alain.ratier (at)eumetsat.int
RATTENBORG Mikael	mikael.rattenborg (at)eumetsat.int
RENAUT Didier	didier.renaut (at)cnes.fr
RENNER Klaus-Peter	klauspeter.renner (at)eumetsat.int
RICHTER Carolin	crichter (at)wmo.int
RIIPA Anja	Anja.Riippa (at)eumetsat.int
RYAN Barbara	BRyan (at)wmo.int
SACHKOV Pavel[3]	unmc (at)mcc.mecom.ru

SAHA G N	gopinathsaha (at)gmail.com
SAKAMOTO Azusa	asakamoto (at)wmo.int
SANDFORD Stephen	stephen.p.sandford (at)nasa.gov
SAULSKIY Viktor	saulskiy (at)planet.iitp.ru
SCHMETZ Johannes	Johannes.Schmetz (at)eumetsat.int
SELIN Victor[1]	perova (at)roscosmos.ru
SHARMA Ashok Kumar	aksimd (at)gmail.com, aksimd (at) hotmail.com
SHYAM Abhineet	abhineetshyam (at)gmail.com
SIMON B	babysimon (at)gmail.com
SINGH Virendra	vsvsingh69 (at)gmail.com
SJUA Abhineet[5]	abhineetshyam (at)sac.isro.gov.in
SMITH Brent	Brent.Smith (at)noaa.gov
SOLOVJEV Valery	solovjev (at)planet.iitp.ru
STOCKER Erich	erich.f.stocker (at)nasa.gov
STOECKEL Sarah	sarah.stoeckel (at)eumetsat.int
SUH Ae-sook	assuh (at)kma.go.kr
SUKHAREV Yuriy[3]	unmc (at)mcc.mecom.ru
TAHARA Yoshihko	y-tahara (at)met.kishou.go.jp
TAUBE Anne	anne.taube (at)eumetsat.int
TKACHENKO Alexander	tkachenko (at)laspace.ru
THAPLIYAL Pradeep	pkthapliyal (at)sac.isro.gov.in
TOMAR C S	cstomar2002 (at)gmail.com
TSUNOMURA Satoru	tsunomura (at)met.kishou.go.jp
TYAGI Ajit	ajit.tyagi (at)gmail.com
ULTRE-GUERARD Pascale	pascale.ultre-guerard (at)cnes.fr
UMEZAWA Kazuo	umezawa.kazuo (at)jaxa.jp
USPENSKY Alexander	uspensky (at)planet.iitp.ru
USPENSKY Sergey	uspenskys (at)planet.iitp.ru
VADDI Rajeswara Rao[2]	rraovaddi (at)yahoo.com
VASANTHA KUMAR N.G	vasant (at)sac.isro.gov.in
VERMA Ram Babu	rbv568 (at)yahoo.co.in, rb.verma (at)imd.gov.in
VOLKOV Sergey	vniiem (at)vniiem.ru
WANG Chungfang	wangcf (at)cma.gov.cn
WANG Qimao	qmwang (at)mail.nsoas.gov.cn
WANG Tian Tian	wangtt (at)cma.gov.cn
WOOLDRIDGE Charles	charles.wooldridge (at)noaa.gov
WU Xuebao	wuxb (at)cma.gov.cn
XU Jianmin	xujm (at)cma.gov.cn
YAMAMOTO Keiko	K8.yamamoto (at)met.kishou.go.jp
YANG Jun	junyang (at)cma.gov.cn
YOON Sungduck	sdyoon1 (at)korea.kr
ZAGREBAEV Vladimir	zagrebaev (at)planet.iitp.ru
ZAYTSEV Alexander	a.zaitsev (at)main.mgo.rssi.ru

*Includes CGMSFREQ list

[1] same email address for four persons
[2] same email address for two persons
[3] same email address for six persons
[4] same email address for two persons
[5] same email address for two persons
[6] same email address for two persons

ZHANG Peng	zhangp (at)cma.gov.cn
ZHANG Wenjian	WZhang (at)wmo.int
ZHANG Zhiqing	zqzhang (at)cma.gov.cn;
ZHAO Licheng	Lczhao (at)cma.gov.cn

CGMS Frequency matters

cgmsfreq (at) wmo.int

ASMUS Vasily	asmus (at) planet.iitp.ru
DAVIS Gary	Gary.davis (at) noaa.gov
DREIS Markus	markus.dreis (at) eumetsat.int
GONZALEZ Joaquin	Joaquin.gonzalez (at) eumetsat.int
JMA (group e-mail)	cgmsfreq (at) dpc.kishou.go.jp
KIM Dohyeong	Dolong (at) korea.kr
LAFEUILLE Jerome	JLafeuille (at) wmo.int
LEE Bongju	bjlee (at) kma.go.kr
MARELLI Edoardo	edoardo.marelli (at) esa.int
McGINNIS Dave	dave.mcginnis (at) noaa.gov
MENTZER James	james.mentzer (at) noaa.gov
PERKINS Marlin	marlin.o.perkins (at) noaa.gov
PLA Jean	Jean.pla (at) cnes.fr
RYAN Barbara	BRyan (at) wmo.int
SINGH Virendra	vsvsingh69 (at) gmail.com
UMEZAWA Kazuo	Umezawa.kazuo (at) jaxa.jp
ZHANG Wenjian	WZhang (at) wmo.int
ZHANG Zhiqing	zqzhang (at) nmsc.cma.gov.cn

CGMS Wind matters

The list server cgmswind (at) wmo.int has been replaced by iwwg (at) ssec.wisc.edu and is maintained by Chris Velden (chris.velden (at) ssec.wisc.edu). Please contact him directly if you would like to be added/removed from the list.

CGMS Virtual Laboratory matters

vl (at) wmo.int

ADAMOU Garba	garbadamou (at) yahoo.fr
AL HARTHY Ahmed	a.alharthy (at) met.gov.om
AL HARTHY Said Abdallah	s.alharthy (at) met.gov.om
AL MASKARI Juma Said	J.almaskari (at) met.gov.om
AL RUMHI Badar Ali	b.alrumhi (at) met.gov.om
ASMUS Vasily	asmus (at) planet.iitp.ru
BARRERA Daniel	dbarrera (at) agro.uba.ar
BRIDGE Gordon	Gordon.bridge (at) eumetsat.int
CASTRO Vilma	vcastro (at) cosmos.ucr.ac.cr
CAESAR Kathy-Ann	kacaesar (at) cimh.edu.bb
CONNELL Bernadette	connell (at) cira.colostate.edu
DIARRA M'Piè	DIARRAMpi (at) asecna.org
DEMARIA Mark	demaria (at) cira.colostate.edu
DONG Chaohua	DCHua (at) nsmc.cma.gov.cn
DESLANDES Roger	r.deslandes (at) bom.gov.au
DUH J.C.	Jc.duh (at) noaa.gov
FAN Hong	Fanh (at) cma.gov.cn
FARRELL David	dfarrell (at) cimh.edu.bb
GÄRTNER Volker	Volker.gaertner (at) eumetsat.int
GOLDBERG Mitch	Mitch.Goldberg (at) noaa.gov
JANG Jaedong	Jaedongjang (at) kma.go.kr
JMA CGMS-VL-matters (group e-mail)	cgmsvl (at) dpc.kishou.go.jp
JORDAAN Winifred	winifred.jordaan (at) weathersa.co.za
KERKMANN Jochen	jochen.kerkmann (at) eumetsat.int
KONGOTI James	kongotii (at) yahoo.com
KPLOGUEDE Emmanuel	kploguede (at) hotmail.com
KIM Dohyeong	dolong (at) korea.kr
KWARTENG Andy Yaw	kwarteng (at) squ.edu.om
LAFEUILLE Jerome	JLafeuille (at) wmo.int
LIU Jian	JianL (at) nsmc.cma.gov.cn
LOYOLLA Fabio	loyolla (at) cptec.inpe.br
MACHADO Luiz	machado (at) cptec.inpe.br
MARINO Monica	marino (at) smn.gov.ar
MIAO Yuleong	Y.Miao (at) bom.gov.au
MILEKHIN Oleg	Milekhin (at) planet.iitp.ru
MOSTEK Tony	anthony.mostek (at) noaa.gov
OU Mi-Lim	milim (at) kma.go.kr
PERES Leonardo	lperes (at) cptec.inpe.br
PESTAINA-JEFFERS Margaret	margpj (at) cimh.edu.bb
POLOGNE Lawrence	lpologne (at) cimh.edu.bb
ROESLI H.-P.	satmet.hp (at) ticino.com
RYAN Barbara	BRyan (at) wmo.int
TAUBE Anne	anne.taube (at) eumetsat.int
VERSCHUUR Henk	henk.verschuur (at) eumetsat.int
WANG Zhenhui	eiap (at) nuist.edu.cn
WILSON Jeff	JWilson (at) wmo.int
WON Jae-Gwang	wonjg (at) kms.go.kr
ZARZA Rafael	Rafael.Zarza (at) eumetsat.int

GLOSSARY

AAPP	AVHRR and ATOVS Processing Package
AATSR	Advanced Along Track Scanning Radiometer
ABI	Advanced Baseline Imager (GOES-R)
ABS	Advanced Baseline Sounder (GOES-R)
ACARS	Automated Communications Addressing and Reporting System
ACC	ASAP Coordinating Committee
ACRIMSAT	Active Cavity Radiometer Irradiance Monitor Satellite (NASA)
ADA	Antarctic Data Acquisition
ADC	Atlantic Data Coverage
ADDE	Abstract Data Distribution Environment
ADEOS-II	Advanced Earth Observing Satellite-II (JAXA)
ADM	Atmospheric Dynamics Mission (ESA)
ADM	Alternative Dissemination Methods
ADM	Advance Dissemination Means (WMO)
ADM-Aeolus	Earth Explorer Atmospheric Dynamics Mission (ESA)
AEMET	Agencia Estatal de Meteorologia (Spain)
AERONET	Remote-sensing aerosol monitoring network programme
AIRS	Advanced IR Sounder
AIT	Assembly Integration and Test
AHI	Advanced Himawari Imager (JMA)
AHRPT	Advanced High Rate Picture Transmission
ALOS	Advanced Land Observing Satellite (JAXA)
AMDAR	Aircraft Meteorological Data Relay
AMR	Altimetry Microwave Radiomete
AMS	American Meteorological Society
AMSR	Advanced Microwave Scanning Radiometer
AMSR-E	Advanced Microwave Scanning Radiometer (modified version on ADEOS-II)
AMSU	Advanced Microwave Sounding Unit
AMV	Atmospheric Motion Vectors
AOCE	Attitude and Orbit Control Electronics
AOPC	Atmospheric Observation Panel for Climate (GCOS)
APSATS	Asian-Pacific Satellite Training
APT	Asia-Pacific Telecommunity (WRC)
APT	Automatic Picture Transmission
Aqua	Earth's water cycle observing mission (NASA)
Aquarius	global sea surface salinity measuring mission (NASA)
ARGOS	Data Collection and Location System
ARINA	scientific payload on Resurs-DK1 for earth quake prediction
ASAP	Automated Shipboard Aerological Programme
ASCAT	C-band dual swath scatterometer (Metop)
ASCII	American Standard Code for Information Interchange
ASDAR	Aircraft to Satellite Data Relay
ASICs	Application Specific Integrated Circuits
ASTER	Advanced Spaceborne Thermal Emission and Reflection Radiometer
AT	Hydrology Algorithm Team (NOAA)
ATMS	Advanced Technology Microwave Sounder
ATOVS	Advanced TOVS
ATSR	Along Track Scan Radiometer (ERS, ESA)
Aura	Mission measuring atmospheric chemistry and trace gases (NASA)
AVHRR	Advanced Very High Resolution Radiometer
AVNIR	Advanced Visible and Near Infrared Radiometer type 2 (ALOS, JAXA)
AWG	Algorithm Working Group (NOAA)
BADC	British Atmospheric Data Center
Baumanets	R & D space technology satellite primarily for students (Roscosmos)
BBC	Black Body Calibration (Meteosat)
BCCP	Business Continuity and Contingency Plan (USA)
BDR	Baseline definition Review (EUMETSAT)
BMD	Basic Meteorological Data
BMTC	Australia Bureau of Meteorology Training Centre
BTD	Brightness Temperature Differences
BUFR	Binary Universal Form for data Representation
BSS	Broadcasting Satellite Service
CAF	Central Application Facilities
CAL	Computer Aided Learning
CALIPSO	Cloud-Aerosol Lidar and Infrared Pathfinder Satellite (NASA/CNES)
CAeM	Commission for Aeronautical Meteorology (WMO)
CART	Cloud and Radiation Test-bed
CAS	Commission for Atmospheric Sciences (WMO)
CboM	Commonwealth Bureau of Meteorology Australia
CBERS	China–Brazil Earth Resources Satellite
CBS	Commission for Basic Systems
CCC	Cross Correlation Coefficient

CCD	Charged Couple Device (INSAT-2E)
CCIR	Consultative Committee on International Radio
CCRI	Climate Change Research Initiative
CCSDS	Consultative Committee on Space Data Systems
CD	Compact Disc
CDAS	Command and Data Acquisition Station
CDMA	Code Division Multiple Access
CDOP	Continuous Development and Operations Phase
CDRs	Climate Data Records
CDS	Climate Data Set (EUMETSAT)
CEOS	Committee on Earth Observation Satellites
CEPT	Conference Européenne des Postes et Télécommunications/ European Conference of Postal and Telecommunications Administrations
Cg	WMO Congress
CGMS	Coordination Group for Meteorological Satellites
CHAMP	German EO Satellite
CHRIS	Compact High Resolution Imaging Spectrometer (PROBA, ESA)
CHRPT	Chinese HRPT (FY-1C and D)
CI	Convective Initiation (NOAA)
CIFDP	Coastal Inundation Forecasting Demonstration Project (WMO/IOC)
CIIS	Common Instrument Interface Studies
CIMS	GOES Channel Interference Monitoring System
CIMSS	Cooperative Institute of Meteorological Satellite Studies, Univ. Wisconsin
CIRs	Climate Information Records
CIS	Commonwealth of Independent States
CISPR	International Special Committee on Radio Interference
CITEL	Inter-American Telecommunication Commission
CLARE	Cloud Lidar And Radar Experiment
CLASS	Comprehensive Large-Array Stewardship System (NOAA)
CloudSat	Global cloud property measuring satellite (NASA/CSA)
CLS	Collecte Localisation Satellites (Toulouse)
CM	WMO Consultative Meetings on High-Level Policy on Satellite Matters
CMA	China Meteorological Administration
CMACast	CMA Data Dissemination System
CMD	Cyclone Warning Dissemination Service
CME	Coronal Mass Ejections
CMIS	Conical Scanning Microwave Imager/ Sounder
CM-SAF	Satellite Application Facility on Climate Monitoring (EUMETSAT)
CMS	Centre de Météorologie Spatiale (France)
CMV	Cloud Motion Vector
CMW	Cloud Motion Wind
CNR	Consiglio Nazionale delle Ricerche (Italy)
CNSA	China National Space Administration
COCTS	10-band Chinese Ocean Colour and Temperature Scanner
COEs	Centres of Excellence (WMO)
COMS	Communication, Ocean and Meteorological Satellite (KMA)
CONAE	Comisión Nacional de Actividades Espaciales (Argentina)
COOP	Coastal Oceans Observations Panel (GOOS)
COP	Conference of the Parties (GCOS)
COSPAR	Committee on Space Research
COSPAS/ SARSAT	International satellite system for search and rescue (SAR)
COVE	CEOS Visualization Environment
CPM	Conference Preparatory Meeting (WRC)
CR	CGMS Consolidated Report
CrIS	Cross track Infrared Sounder
CRYOSAT	Polar Ice Monitoring Programme (ESA)
CSR	Clear Sky Radiance
CZI	4-band Coastal Zone Imager (HY-1B).
DADDS	DCS Administration and Data Distribution System (NOAA)
DANTE	Delivery of Advanced Network Technology to Europe
DAPS	DCS Automated Processing System (USA)
DCP	Data Collection Platform
DCPC	Data Collection or Production Centre (WIS, WMO)
DCRS	Collaboration on Global Frequency Allocation harmonization
DCS	Data Collection System
DCWDS	Digital Cyclone Warning Dissemination System (India)
DIF	Directory Interchange Format
DMSP	Defense Meteorological Satellite Program (USA)
DNR	Draft new ITU-R Recommendations
DOD	Department of Defense (USA)

DOMSAT	Domestic telecommunications relay Satellite (NOAA)
DPC	Directional Polarisation Camera (CNSA)
DPI	Derived Product Images (USA)
DPM	WMO Natural Disaster Prevention and Mitigation Programme
DPR	Dual-frequency Precipitation Radar
DPT	Delayed Picture Transmission
DR	Direct Readout services (ADM)
DRS	DCP Retransmission System (Meteosat)
DRT	Data Relay Transponder (INSAT)
DSB	Direct Soundings Broadcast
DSCOVR	Deep Space Climate Observatory (NASA)
DUS	Data Utilisation Station (USA) (Japan)
DVB	Direct Video Broadcast
DWS	Disaster Warning System (India)
EARS	EUMETSAT ATOVS Retransmission Service
EarthCARE	Cloud & aerosol mission (ESA)
EBB	Electronic Bulletin Board
EC	Executive Council (WMO)
ECP	European Common Proposal (CEPT)
EC-PORS	Executive Council Panel of Experts on Observations, Research and Services
ECT	Equator crossing time
ECV	Essential Climate Variables
ECMWF	European Centre for Medium-Range Weather Forecasts
EDR	Environmental Data Records (NPOESS)
EDU	Engineering Development Unit
EE	Earth Explorer (ESA)
EEIS	EUMETSAT External Information System
EESS	Earth Exploration Satellite Service (Frequency Management)
EGM-96	Earth Geodetic Model
EIRP	Effective isotropically-radiated power
EGOS-IP	Implementation Plan for the Evolution of Global Observing Systems
ELEKTRO	Geostationary meteorological satellite
EMWIN	Emergency Manager Weather Information Network (NOAA)
ENG	Electronic News Gathering
ENVISAT	ESA polar satellite for environment monitoring
EO	Earth Observation
EOS	Earth Observation System
EPA	US Environmental Protection Agency
EPS	EUMETSAT Polar System
EPS-SG	EPS Second Generation
ERA-CLIM	European Re-Analysis of global CLIMate observations
ERB	Earth Radiation Budget
ERBE	Earth Radiation Budget Experiment
ERBS	Earth Radiation Budget Satellite (NASA)
ERM	Earth Radiation Measurement
ERS	ESA Remote Sensing Satellite
ESA	European Space Agency
ESA-CCI	ESA Climate Change Initiative
ESCAP	Economic and Social Commission for Asia and the Pacific, UN
ESJWG	Earth Sciences Joint Working Group
ESOC	European Space Operations Centre (ESA)
ESRC	Environmental Satellite Resource Center
ET-ODRRGOS	Expert Team on Observational Data Requirements and Redesign of the GOS
ET-EGOS	Expert Team on Evolution of the Global Observing System (WMO)
ETM	Enhanced Thematic Mapper (NASA)
ET-SAT	Expert Team on Satellite Systems (WMO)
ET-SUP	Expert Team on Satellite Utilisation and Products (WMO)
EU	European Union
EUCOS	EUMETNET Composite Observing System
EUMETCast	EUMETSAT Satellite Data Dissemination System
EUMETNET	The Network of European Meteorological Services
EUMETSAT	European Organisation for the Exploitation of Meteorological **Satellites**
EURD	End User Requirements Document (EUMTETSAT)
FAA	Federal Aviation Authority (USA)
FAO	Food and Agriculture Organisation (UN)
FAPAR	Fraction of Absorbed Photosynthetically Active Radiation
FCDR	Fundamental Climate Data Record FENGYUNCast FENGYUN Satellite Data Dissemination System
FCI	Flexible Combined imager
FGDC	Federal Geographic Data Committee
FOV	Field of View (NOAA)
FTP	File Transfer Protocol
FXTS	Facsimile Transmission System (USA)
FY-1	Polar-orbiting Meteorological Satellite (PRC)
FY-2	Future Geostationary Meteorological Satellite (PRC)
FY-3	Second generation of Polar-orbiting Meteorological Satellite (PRC)

GAW	Global Atmosphere Watch (WMO Atmospheric Research Environment Programme)
GCC	GSICS Coordination Center
GCMP	GCOS Climate Monitoring Principles (GCOS)
GCOM	Global Change Observation Mission (JAXA)
GCOS	Global Climate Observing System
GCW	Global Cryosphere Watch
GDPT	Chinese Delayed Picture Transmission Format (Global Data) (FY-1C)
GDS	Ground Data System
GDWG	GSICS Data Working Group
GEO	inter-governmental Group on Earth Observations
GEOSS	Global Earth Observation System of Systems
GERB	Geostationary Earth Radiation Budget (MSG, EUMETSAT)
GESN	Global Education and Science Network
GEWEX	Global Energy and Water Cycle Experiment (WCRP)
GFCS	Global Framework for Climate Services
GHGs	Greenhouse Gases
GII	Global Instability Index (JMA)
GIFTS	Geosynchronous Imaging Fourier Transform Spectrometer (NASA)
GIS	Geographic Information System
GISC	Global Information System Centre (WIS, WMO)
GIMTACS	GOES I-M Telemetry and Command System
GLI	Generation Global Imager (GCOM)
GLM	Geostationary Lightning Mapper (GOES, NOAA)
GLOBUS	multichannel scanning radiometer (Meteor-3M N2)
Glory	CCRI global distribution of natural and anthropogenic aerosols mission (NASA)
GMES	Global Monitoring for Environment and Security (EU)
GMR	GOES Meteosat Relay
GMS	Geostationary Meteorological Satellite (Japan)
GNC	GEONETCast Network Centers
GNC-A	GEONETCast Americas
GNOS	GNSS Occultation Sounder
GNSS	Global Navigation Satellite System
GOCE	Gravity Field and Steady State Ocean Circulation Explorer (ESA)
GOCI	Geostationary Ocean Color Imager (KMA)
GOES	Geostationary Operational Environmental Satellite (USA)
GOES-R	Geostationary Operational Environmental Satellite - R Series (NOAA)
GOME	Global Ozone Monitoring Experiment (Metop, ERS)
GOMS	Geostationary Operational Meteorological Satellite (Russ. Fed.)
GOMAS	Geostationary Observatory for Microwave Atmospheric Sounding (WMO)
GOOS	Global Ocean Observing System (IOC, UNEP, WMO, ICSU)
GOS	Global Observing System (WMO)
GOSAT	Greenhouse Gases Observing Satellite (JAXA/Jap. Min. of Environment)
GPCP	Global Precipitation Climatology Project
GPM	Global Precipitation Measurement (JAXA/NASA)
GPPA	Procedure for Product Acceptance (GSICS)
GPRC	GSICS Processing and Research Center (CMA)
GPS	Global Positioning System
GRA	GOOS Regional Alliances
GRACE	Gravity Recovery and Climate Experiment (NASA/DLR)
GRAS	GNSS Receiver for Atmospheric Sounding
GRB	GOES Re-Broadcast
GRIB	Data representation form for General Regularly-distributed Information in Binary (WMO)
GRP	GEWEX Radiation Panel (GEWEX, WCRP)
GRWG	GSICS Research Working Group
GS	Ground Segment
GSICS	Global Satellite Intercalibration System
GSLMP	Global Sea Level Monitoring Programme
GTS	Global Telecommunication System (WMO)
GRUAN	GCOS Reference Upper Air Network (GCOS)
GVAR	GOES Variable (data format) (USA)
GIIPSY	Global Interagency IPY Polar Snapshot Year project
HAPS	High Altitude Platform System
HDF	Hierarchical Data Format
HDFS	High Density Fixed Service
HDFSS	High Density Fixed Satellite Systems

HDR	High Data Rate
HEO	Highly Elliptical Orbit
HES	Hyperspectral Environmental Suite (GOES, NOAA)
HIRAS	Infrared Atmospheric Sounder (FY-3, CMA) replaced IRAS.
HIRDLS	High Resolution Dynamics Limb Sounder (NASA)
HiRID	High Resolution Imager Data
HIRS	High Resolution Infrared Sounder
HR	High Resolution
HRD	High Rate Data (NPOESS, USA)
HRDCP	High Rate DCP
HRIT	High Rate Information Transmission
HRIT/EMWIN	High Rate Information Transmission, Emergency Managers Weather Information Network
HRPT	High Rate Picture Transmission
HRV	High Resolution Visible (EUMETSAT)
HSRS	High Spectral Resolution Sounder (MSG)
HWR	Hydrology and Water Resource Programme (WMO)
HYDROS	Hydrosphere State Mission (NASA)
IAMAP	International Association of Meteorology and Atmospheric Physics (NOAA)
IASI	Infrared Atmospheric Sounding Interferometer (EUMETSAT)
ICAO	International Civil Aviation Organization
ICESat	Ice Cloud and Land Elevation Satellite (NASA)
ICI	Inversion Coupled with Imager (Meteo-France)
ICSC	CAS International Core Steering Committee (THORPEX)
ICTSW	Inter-Programme Coordination Team on Space Weather (WMO)
ICVS	Intrument Calibration Validation System (NOAA)
ICWG	International Coordination Working Group (EO)
IDCP	International DCP
IDCS	International Data Collection System
IDDI	Infra-red Difference Dust Index
IDN	International Directory Network (CEOS)
IDPS	Interface Data Processing Segment (NPOESS)
IFRB	International Frequency Registration Board
IGACO	Integrated Global Atmospheric Chemistry Observations (IGOS)
IGDDS	Integrated Global Data Dissemination Service
IGEOLab	International Geostationary Laboratory concept
IJPS	Initial Joint Polar-orbiting Operational Satellite System (NOAA/EUMETSAT)
IKFS-2	advanced IR atmospheric sounder
IMT-2000	International Mobile Telecommunication 2000 (before FPLMTS)
INPE	Instituto Nacional de Pesquisas Espaciais
INSAT	Indian geostationary satellite
IOC	Intergovernmental Oceanographic Commission (UNESCO)
IODC	Indian Ocean Data Coverage
IOP	Initial Operations Phase (SAF, EUMETSAT)
IOTWS	Indian Ocean Tsunami Warning Service
IPD	International Polar Decade
IPO	Integrated Program Office (NOAA)
IPOMS	International Polar-orbiting Meteorological Satellite Group
IPWG	International Precipitation Working Group
IPWV	Integrated Precipitable Water Pour (IMD)
IPY	International Polar Year (ICSU, WMO)
IQGSE	Image Quality Ground Support Equipment (EUMETSAT)
IR	Infrared
IRC	International Radiation Commission
IRAS	Infrared Atmospheric Sounder (FY-3, CMA) (been replaced by HIRAS)
IROWG	International Radio Occultation Group
IRTS	Infrared Temperature Sounder (EPS)
IRW	Infrared Window
ISS	Information Systems and Services; International Space Station
ISCCP	International Satellite Cloud Climatology Project (GEWEX, WCRP)
ISADP	Integrated System for the ATOVS Data Processing
ISO	International Organization for Standardisation
ISWMR	SAF Integrated Satellite Wind Monitoring Report (EUMETSAT)
ISY	International Space Year
ITSC	International TOVS Study Conference
ITT	Invitation to Tender
ITU	International Telecommunication Union
ITU-R	ITU Radiocommunication Sector
ITWG	International TOVS Working Group
IVOS	Infrared and Visible Optical System Calibration (CEOS WGCV)

IWSATC	International Workshop on Satellite Analysis of Tropical Cyclones (WMO)
IWW	International Winds Workshop
IWWG	International Winds Workshop Group
JASON	Ocean surface Topography follow-on mission to TOPEX/POSEIDON (CNES/NASA)
JAXA	Japan Aeronautic Exploration Agency (name change of NASDA)
JCOMM	Joint WMO/IOC Technical Commission for Oceanography and Marine Meteorology
JCSDA	Joint Centre for Satellite Data Assimilation (USA)
JMA	Japan Meteorological Agency
JSpOC	Joint Space Operations Center (NOAA)
JPSS	Joint Polar-orbiting Satellite System (NOAA)
JRA-25	"Japanese Re-Analysis 25 years" JMA research project of long-range re-analysis of global atmosphere
JSC	Joint Scientific Committee (WCRP)
KARI	Korea Aerospace Research Institute
KLIMAT	scanning Infrared radiometer on Meteor-3M 1 (Russia)
KMA	Korea Meteorological Administration
KNMI	the Royal Dutch Meteorological Institute
KOMPAS	Microsatellite, earthquake investigations (Roscosmos)
KOMPSAT	Korea Multi-Purpose Satellite
KOSC	Korea Ocean Satellite Center (KMA)
KWAJEX	Kwajalein Experiment (NASA)
LAI	Leaf Area Index (WMO)
LAN	Local Area Networks (Telecommunication)
Landsat	NASA Earth observing Satellite (NASA/USGS)
LSA SAF	Land Surface Analysis Satellite Application Facility (EUMETSAT)
LBR	Low Bit Rate
LCL	Latch Current Limiter
LDCM	Landsat Data Continuity Mission (NASA/US Geological Survey)
LDPT	Chinese Delayed Picture Transmission Format (Local Data Coverage) FY-1C
LEOP	Launch and Early Operations Phase
LIDAR	Light Detection And Ranging (WMO)
LIS	Lightning Imaging Sensor
LR	Low Resolution
LRD	Low Rate Data (NPOESS, USA)
LRIT	Low Rate Information Transmission
LRPT	Low Rate Picture Transmission
LSPIM	Land Surface Processes and Interactions Mission (ESA)
LST	Local Solar Time
MAP	Mesoscale Alpine Experiment
MAP-SST	Merged Atlantic Product - Sea Surface Temperature (SAF, EUMETSAT)
MARF	Meteorological Archive and Retrieval Facility (EUMETSAT)
MBWG	MSG Biosphere Working Group
MCP	Meteorological Communications Package
MCUT	Multi-Constellation User Terminal (NOAA)
MCSST	Multi-Channel Sea Surface Temperature Method
MDD	Meteorological Data Distribution (Meteosat)
MDUS	Medium-scale Data Utilization Station (for GMS S-VISSR)
MEGHA-TROPIQUE	CNES/ISRO mission
MERIS	Medium Resolution Imaging Spectrometer (ENVISAT)
MERSI	Medium Resolution Spectral Imager (FY-3, CMA)
MetAids	Meteorological Aids Service (frequency regulation)
Metop	European meteorological polar-orbiting satellite
METEOR	Polar-orbiting meteorological satellite (Roshydromet)
Meteosat	Geostationary meteorological satellite (EUMETSAT)
METSAT	Indian geostationary meteorological satellite
MetSat	meteorological satellite systems (frequency regulation)
MHS	Microwave Humidity Sounder (EPS)
MI	Meteorological Imager (KMA)
MIEC	Meteorological Information Extraction Centre (ESOC)
MIMR	Multi-frequency Imaging Microwave radiometer
MISR	Multi-angle Imaging Spectroradiometer
MIVZA	microwave scanning radiometer (Meteor 3M N1)
MOCC	Meteosat Operational Control Centre (ESOC)
MODIS	Moderate Resolution Imaging Spectroradiometer (NOAA)
MOP	Meteosat Operational Programme
MONITOR-E	Land Observing Satellite (Roscosmos)
MOSDAC	Meteorological and Oceanographic Satellite Data Archival Centre

MPEF	Meteorological Products Extraction Facility (EUMETSAT)
MPI	MODIS Profile Instability
MSC	Meteorological Satellite Centre (Japan)
MSC-CAL	Computer Aided Learning system by JMA/MSC
MSG	Meteosat Second Generation
MSM	Meso-Scale Model
MSMR	Multichannel Scanning Microwave Radiometer (OCEANSAT-1)
MSS	Mobile Satellite Services (frequency regulation)
MSSEESS	Mobile Satellite Services of Earth Exploration Satellite Service
MSU	Microwave Sounding Unit
MTG	Meteosat Third Generation
MTP	Meteosat Transition Programme
MTS	Microwave Temperature Sounder (EPS)
MTSAT	Multi-functional Transport Satellite (Japan)
MTVZA	microwave scanning radiometer (Meteor 3M N1)
MVIS	Multi-channel VIS and IR Radiometer (FY-1C and D of PRC)
MWHS	Microwave Humidity Sounder
MWI	Microwaver Imaging Mission (EUMETSAT)
MWR	Microwave Radiometer (ERS, ESA)
MWRI	Microwave Radiation Imager (FY-3, CMA)
MWRS	Microwave Radiometers
MWTS	Microwave Temperature Sounder (FY-3, CMA)
NAMMA	NASA African Monsson Mutlidisciplinary Analyses
NASA	National Aeronautics and Space Agency
NASDA	National Space Development Agency of Japan (changed to JAXA in 2003)
NCDC	National Climate Data Center (NOAA)
NCEP	National Centers for Environmental Prediction
NCSW	National Centre for Space Weather
NEDT	Noise Equivalent Delta Temperature
NESDIS	National Environmental Satellite Data and Information Service
NGDC	National Geophysical Data Centre (USA)
NGSO	Non-geostationary systems
NIMH	National Institute of Meteorology and Hydrology (
NIST	US National Institute of Standards and Technology
NMC	National Meteorological Centre
NMHS	National Meteorological & Hydrological Service
NMP EO-1	New Millennium Program Earth Observing Mission (NASA)
NOAA	National Oceanic and Atmospheric Administration
NOS	National Ocean Service (USA)
NPOESS	National Polar-orbiting Operational Environmental Satellite System (USA)
NPP	NPOESS Preparatory Project
NRT	Near real Time
NSMC	National Satellite Meteorological Center of CMA (PRC)
NTIA	National Telecommunications and Information Agency (USA)
NWC SAF	Nowcasting Satellite Application Facility (EUMETSAT)
NWP	Numerical Weather Prediction
NWS	National Weather Service (USA)
NWSTG	NOAA's National Weather Service Telecommunications Gateway
OCAP	Operational Consortium of ASDAR Participants
OCEANSAT	Indian satellite for ocean applications
OCO	Orbiting Carbon Observatory (NASA)
OKEAN	Naval radar satellite network
OLR	Outgoing Longwave Radiation
OOPC	Oceans Observations Panel for Climate (GOOS)
OPAG-IOS	Open Programme Area Group in Integrated Observing Systems **(successor** of CBS WG on Satellites)
OSE	Operational System Experiments (ET-ODRRGOS)
OSI	Ocean and Sea Ice
OSI SAF	SAF on Ocean and Sea Ice
OSSE	Observing System Simulation Experiments (ET-ODRRGOS)
OSTM	Ocean Surface Topography Mission (Jason-2) (CNES/NASA/ NOAA/ EUMETSAT)
OWSE-AF	Operational WWW Systems Evaluation for Africa
PALSAR	Phased Array type L-band Synthetic Aperture Radar ((ALOS, JAXA)
PAMELA	AntiMatter Exploration and Light-nuclei Astrophysics
PATMOS	AVHRR Pathfinder Atmosphere (NOAA)
PATMOS-x	Pathfinder Atmospheres Extended (NOAA)
PC	Personal Computer
PCR	Preliminary Concept Reviews (EUMETSAT)

PCW	Polar Communications and Weather mission
PDR	Preliminary Design Review (EUMETSAT)
PDRR	Preliminary draft revised Recommendations
PMW	Passive Microwave
POEM	Polar-orbiting Earth Observation Mission (ESA)
POES	Polar-orbiting Operational Environmental Satellite (USA)
PR	Precipitation Radar (on TRMM, JAXA)
PRR	Preliminary Requirements Review
PRC	People's Republic of China
PRISM	Panchromatic Remote-sensing Instrument for Stereo Mapping (ALOS, JAXA)
PROBA	Project for On-Board Autonomy (ESA EO satellite)
PTT	Post Telegraph and Telecommunications authority
PTWC	Pacific Tsunami Warning Centre
QA4EO	Quality Assurance Framework for Earth Observation
QI	Quality Indices (EUMETSAT)
QuikSCAT	Quik Scatterometer (NASA)
RA	Regional Association of WMO
RARS	Regional ATOVS Re-transmission System (WMO)
RAMSDIS	Menu-driven system for analysing digital satellite imagery **(McIDAS,** USA)
RAOBS	Radiosonde Observations
RASA	Russian Aviation and Space Agency
RDCA	Rapidly Developping Cumulus Areas
RDCP	Regional DCP (Japan)
RDR	Raw Data Records (NPOESS)
Resurs-DK	Russian land observing satellite (Roscosmos)
RFI	Radio Frequency Interference
RLAN	new wireless LANs
RMDCN	Regional Meteorological Data Communication Network
RMS	Root Mean Square
RMSE	Root Mean Square Error
RMTC	Regional Meteorological Training Centre (WMO)
Roscosmos	[Russian] Federal Space Agency
Roshydromet	Russian Federal Service for Hydrometeorology and Environmental Monitoring
RR	Radio Regulations
RRR	Rolling Requirements Review (WMO)
RS	Rapid Scan
RSB	Reflective Solar Bands (MODIS NOAA)
RSMC	Regional Specialised Meteorological Centre
RSO	Rapid Scan Operations (NOAA)
RSS	Rapid Scan Service (EUMETSAT)
RT	Radiative Transfer
S&R	Search and Rescue mission
SAC-C	Satellite de Aplicaciones Cientificas-C
SAF	Satellite Application Facility (EUMETSAT)
SAFNWC	SAF to support to Nowcasting and Very Short Range Forecasting
SAFISY	Space Agency Forum on the ISY
SAGE III	Stratospheric Aerosol and Gas Experiment (NASA)
SAM	Satellite Anomaly Manager
SAR	Synthetic Aperture Radar (ERS ESA)
SARA	Short Range Automotive Radar (frequency management)
SARSAT	Search And Rescue, Satellite supported facility
SAST	Shanghai Academy of Space Technologies.
SATAID	Satellite Animation and Interactive Diagnosis (Japan)
SATOB	WMO code for Satellite Observation
SAWS	South African Weather Service
SBA	Societal Benefit Area
SBSTA	UNFCCC Subsidiary Body for Scientific and Technology Advice
SBUS	Solar Backscatter Ultraviolet Sounder (FY-3, CMA)
SBUV	Solar Backscattered Ultra Violet (ozone)
SCOPE-CM	Sustained, Co-Ordinated Processing of Environmental Satellite Data for Climate Monitoring
SD	Solar Diffuser (MODIS)
SDR	Sensor Data Records (NPOESS)
SDS-WAS	Sand and Dust Storm Warning & Assessment System (WMO)
SEAS	Shipboard Environmental (data) Acquisition System
SEC	Space Environment Center (NOAA)
SEE	South Eastern Europe (
SEISS	Space Environmental In-Situ Suite (GOES, NOAA)
SEM	Space Environment Monitor (GOES)
SEVIRI	Spinning Enhanced Visible and Infrared Imager (MSG)
S-FAX	S-band facsimile broadcast of FY-2 (PRC)
SFCG	Space Frequency Coordination Group
SGLI	Second Generation Global Imager (CGOM-B1)

SG-RFC	Steering Group on Radio Frequency Coordination
SICH-1M	Russian oceanographic satellite (Roscosmos)
SIS	Solar Imaging Suite (GOES, NOAA)
SMA	State Meteorological Administration (PRC)
SMD	Stored Mission Data (NPOESS)
SMOS	Soil Moisture and Ocean Salinity (ESA)
SNO	Simultaneous Nadir Overpass (GSICS)
SOCC	Satellite Operations Control Center (NOAA)
SORCE	Solar Radiation and Climate Experiment (NASA)
SOT	Ship Observation Team (JCOMM)
SP	Space Programme (WMO)
SRC "Planeta"	Scientific Research Center of Space Hydrometeorology "Planeta"
SRD	Short-Range Devices
SRR	Automotive Short-Range Radars (frequency management)
SRF	Spectral Response Function
SRS	Space Research Service (frequency regulation)
SRSO	Super-Rapid-Scan Operations
SRTM	Shuttle Radar Topography Mission (NASA)
SSM/I	Special Sensor Microwave/Imager (NOAA)
SSMI/S	Special Sensor Microwave Imager/ Sounder (NOAA)
SSMR	Scanning Multispectral Microwave Radiometer
SSMT1	microwave temperature sounder (NOAA)
SSMT2	microwave water vapour sounder (NOAA)
SSP	Sub-Satellite Point
SSRR	Satellite System Requirements Review (EUMETSAT)
SST	Sea Surface Temperature
SSU	Stratospheric Sounding Unit
STAR	Center for Satellite Applications and Research (NOAA)
STC	Semi-Transparent Correction (NOAA)
STG	Scientific and Technical Group (EUMETSAT)
STVA	SWIR-TIR Volcanic Ash
S-VISSR	Stretched VISSR
SWARM	Earth Observation mission (ESA)
SWFDP	Severe Weather Forecasting demonstration Project
SWFDDP	Severe Weather Forecasting and Disaster Risk Reduction Demonstration Project
SWIR	Short Waved Infrared (NASA)
SXI	Solar X-Ray Imager (GOES-12)
System PRD	System Preliminary Design Review (EUMETSAT)
TANSO-CAI	Thermal And Near infrared Sensor for carbon Observations - Cloud and Aerosol imager
TANSO-FTS	Thermal And Near infrared Sensor for carbon Observations - Fourier Transform Spectrometer
TC	Tropical Cyclone
TCDRs	Thematic Climate Data Records (
TEFLUN	TExas and FLorida UNderflights (TEFLUN)
TERRA	Earth climate measuring satellite (NASA)
TD	Technical Document (WMO)
TDR	Temperature Data Record
THORPEX	International global atmospheric R & D programme (WMO CAS)
TIGGE	THORPEX Interactive Grand Global Ensemble
TIROS	Television Infrared Observation Satellite
TMI	TRMM Microwave Imager
TOMS	Total Ozone Mapping Spectrometer (NASA)
TOR	Terms of Reference
TOU	Total Ozone Unit (FY-3, CMA)
TOVS	TIROS Operational Vertical Sounder
TPW	Total Precipitable Water (NOAA)
TRMM	Tropical Rainfall Measuring Mission (NASA, JAXA)
TRSR	Turbo Rogue Space Receiver (Jason)
TSO	Technical Support Officer (WMO)
TTC	Telemetry Tracking Control
TPW	Total Precipitable Water
UAS	Unmanned Aerial Systems
UARS	Upper Atmosphere Research Satellite (NASA)
U-MARF	United Meteorological Archive Retrieval Facility (EUMETSAT)
UHF	Ultra High Frequency
UK	United Kingdom
UMTS	Universal Mobile Telecom System
UN	United Nations
UNFCCC	United Nations Framework Convention on Climate Change
UNISPACE	United Nations Space Conference
UN-OOSA	UN Office of Outer Space Affairs
USA	United States of America
USGS	United States Geological Survey
UPS	Unified Propulsion Subsystem
UTC	Universal Time Coordinated
UWB	Ultra Wide Band

VACCs	Volcanic Ash Advisory Centers
VAS	VISSR Atmospheric Sounder
VGT	Vegetation
VHF	Very High Frequency
VHRR	Very High Resolution Radiometer
VIIRS	Visible Infrared Imaging Radiometer Suite
VIRR	Visaible and Infrared Scanning Radiometer
VIRSR	Visible and Infrared Scanning Radiometer (EPS)
VIS	Visible channel
VIS-IR	Mid-infrared Camera/Spectrometer (VISIR)
VISITView	VL tool
VISSR	Visible and Infrared Spin Scan Radiometer
VL	Virtual Laboratory (training concept)
VL-FG	VL Focus Group Meeting
VLMG	Virtual Laboratory Management Group
VLSI	Very Large Scale Integrated circuit
VPN-PP	WIS Virtual Private Network Pilot Project
VTX	VHF transmitter (NOAA)
V&V	Verification and Validation
WALEX	WAter vapour Lidar EXperiment
WARC	World Administrative Radio Conference
WCRP	World Climate Research Programme (WMO/ IOC/ ICSU)
WCS	WMO Core Standards
WEFAX	Weather facsimile
WG	Working Group
WGCV	CEOS Working Group on Calibration and Validation
WGNE	Working Group on Numerical Experimentation
WGS84	World Geodetic System 1984
WHyCOS	World Hydrological Cycle Observing System (HWR, WMO)
WIS	WMO Information System
WMO	World Meteorological Organization
WOAP	WCRP Observation and Assimilation
WP	Working Paper
WRC	World Radio Conference (ITU)
WV	Water Vapour
WVMW	Water Vapour Motion Winds
WWRP	World Weather Research Programme
WWRP-WGNR	World Weather Research Programme – Working Group for Nowcasting Research
WWW	World Weather Watch (WMO)
X-ADC	Extended Atlantic Data Coverage
XRS	X-ray Spectrometer
Y2K	Year 2000 compatibility
ZAP	Z-axis Precession Mode (GOES)
YOTC	Year of Tropical Convection Project (WMO)
ZAMG	Zentralanstalt für Meteorologie und Geodynamik (Austrian NMHS)