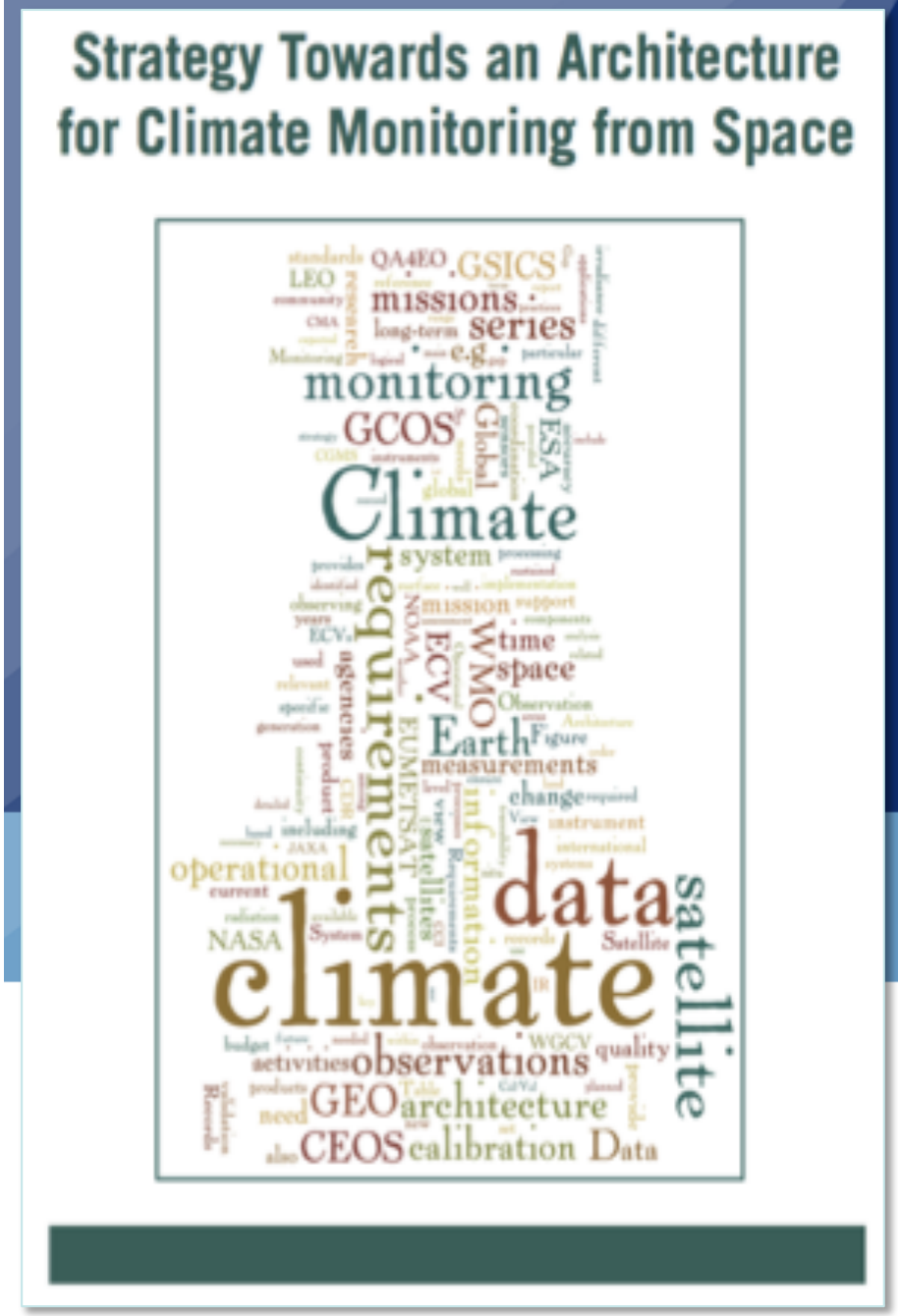
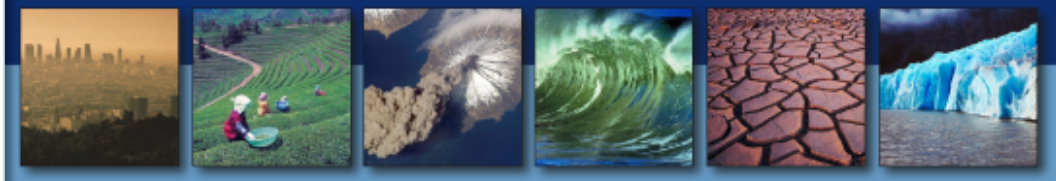


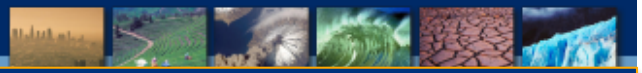
CEOS Working Group on Climate

Jörg Schulz
Mark Dowell
John Bates



CEOS: Committee on Earth Observation Satellites

CEOS Structure 2012-2013



Troika

(1-year terms)

Past Chair	Chair	Future Chair
ISRO/India	CSA/Canada	EUMETSAT/Europe

Systems Engineering Office (SEO)
NASA

Strategic Implementation Team (SIT)
Chair: NASA Vice Chair: CNES
(2-year terms)

Permanent Secretariat
Chair Agency
ESA, EUMETSAT, JAXA, NASA, NOAA

CEOS Executive Officer (CEO)
USGS (CEO) & NOAA (DCEO)
(2-year terms)

WGCV	WGISS	WGCapD	WGClimate
Chair CSA Vice Chair DLR	Chair JAXA Vice Chair CNES	Chair INPE Vice Chair NOAA	Chair EC-JRC Vice Chair NOAA

(2-year terms)

CEOS SBA Coordinators
- Agriculture
- Biodiversity
- Disasters
- Ecosystems
- Energy
- Health
- Water

Virtual Constellations for GEO

Atmospheric Composition
- NASA
- ESA

Precipitation
- JAXA
- NASA

Land Imaging
- USGS
- ISRO
- INPE

Ocean Surface Topography
- NASA
- EUMETSAT

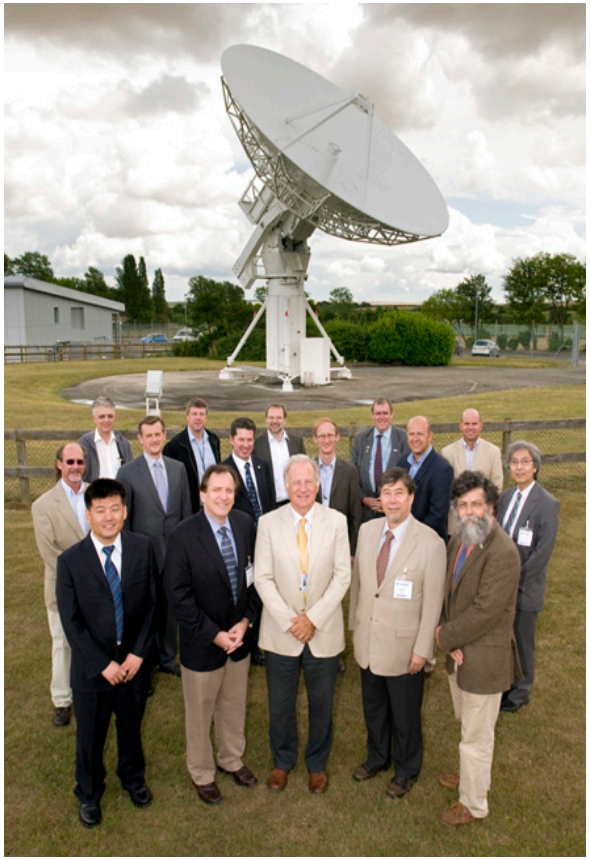
Ocean Color Radiometry
- ESA
- ISRO
- NASA

Ocean Surface Vector Wind
- NOAA
- ISRO
- EUMETSAT

Sea Surface Temperature
- ESA
- NOAA

WGCV=Working Group on Calibration and Validation
WGISS=Working Group on Information Systems and Services
WGCapD=Working Group on Capacity Building and Data Democracy
WGClimate = Working Group on Climate
SBA = Societal Benefit Area (GEO)

Committee on Earth Observing Satellites Working Group on Climate (WGClimate)



WGClimate was endorsed as a full CEOS WG (joining WGISS, WGCV and WGEdu) and will coordinate and encourage collaborative activities between the world's major space agencies in the area of climate monitoring

The Mission of the Working Group Climate (WGClimate) is to facilitate the implementation and exploitation of Essential Climate Variable (ECV) time-series through coordination of the existing and substantial activities undertaking by CEOS member agencies. This includes the numerous iterative steps involved in the creation of ECVs and ensuring ECV life cycle information is gathered, organized, and preserved for future generations.

Chair of CEOS WGClimate
Mark Dowell (EC/JRC)
Vice Chair John Bates (NOAA/NCDC)

CEOS Response to GCOS IP update

- Responds to the GCOS Actions
- Reinforces the needs called out by the GCOS Satellite Supplement
  - Provides more detail on the deliverables, coordination, activities and who will lead the effort.
  - Calls out agency activities
  - Calls out international coordination
- Can include additional activities not called out by GCOS but may be considered important by CEOS.
- Available through CEOS website (www.ceos.org)

47 Actions addressed

Text relevant to CEOS in SBSTA-37 conclusions

"The SBSTA expressed its appreciation to CEOS for its update on progress made by space agencies providing global observations in their coordinated response to relevant needs of the Convention. It noted the importance of continuing and sustaining satellite observations on a long-term basis, and the role of CEOS in promoting full and open data sharing, in order to support the work under the Convention. It invited CEOS to provide, by SBSTA 41, an updated report on progress made by space agencies providing global observations in their coordinated response to relevant needs of the Convention."

CEOS needs to consider how it addresses future reporting to UNFCCC/SBSTA and it's support for the convention. SBSTA would, in future reporting cycles, appreciated update including all CEOS activities relevant to the Convention, including: support to GCOS, support to REDD, and the work of the CTF on carbon

July 4, 13

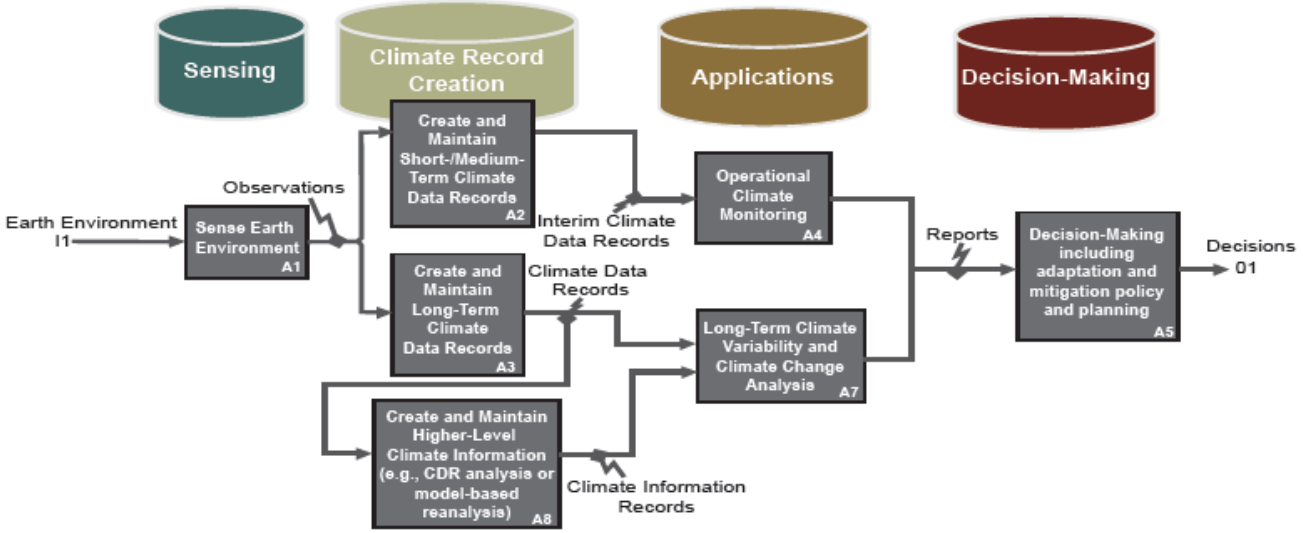
Major Activity Areas of WG Climate

Strategy Report on a Climate Monitoring Architecture

1. Executive Summary and recommendations
2. Introduction, Objectives & Targets
3. Climate Monitoring Principles, Requirements & Guidelines
4. State of the Art
5. Beyond research to operations
6. Climate Architecture definition
7. Mechanisms for Interaction
8. Roadmap for way forward
9. Recommendations

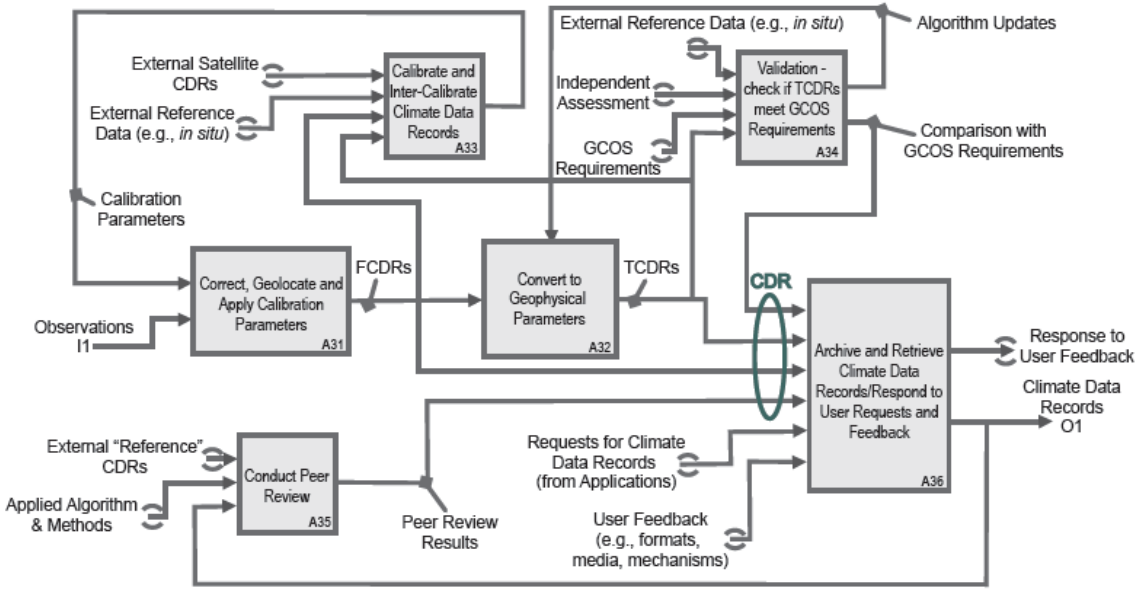
This strategy document is also seen as a foundations for the GFCS Monitoring and Observation Pillar

Logical Representation



Traceable **to** GCOS Guidelines and GCOS Climate Monitoring Principles

Traceable **from** ECV Inventory and physical representation of Climate Monitoring Architecture



Way Forward

Define, Validate and Obtain Consensus on Overall Approach

Current status

Describe Current and Planned Implementation Arrangements (ECV-by-ECV) within the Physical Architecture

Use the Physical Architecture to Develop a Coordinated Action Plan to Address Identified Gaps/ Shortfalls

Short-term

(within 2 years)

Medium-term

(2-4 years)

ECV Inventory Questionnaire

- Joint activity CEOS and CGMS
- Call released with CEOS MIM in May 2012, responses were due October 5th – extended to January 2013
- Questionnaire form – through a web interface.
- 45 total questions based on 5 topics (General, Usage, Stewardship, Properties, Access).
- Many questions use menu selections (12 menus).
  Some example menus are: Agency, Project, ECV, Satellite, Data Format.
- Responses were requested at the dataset level
- Addresses both existing/past missions and future/planned mission in two separate questionnaires
- Each single entry takes on average 25 minutes to complete

ECV Inventory @ http://www.ecvinventory.com

Home View ECV Records Editor LOGIN Administrator LOGIN

Search Category Show All

ECV Record Id	CDR_ECV04_7
Responder name	Rainer Hollmann
Responder email	rainer.hollmann@dwd.de
Data Set Identifier	Yes, new release of CM SAF (CM-05)
Responsible organization	EUMETSAT
International Coordination	yes SCOPE-CM
Assessment body	no
Quality control organization	no
Climate applications	cloud feedback, radiation budget
Essential Climate Variable (ECV)	Cloud amount
Collection organization	NOAA *EUMETSAT*
Calibration organization	NOAA
Intercalibration organization	NOAA
FCDR organization	NOAA
TCDR organization	EUMETSAT *CM SAF (DWD, KNMI, SMHI)*
GCOS Requirements Assessments organization	EUMETSAT *CM SAF*
Independent peer review organization	EUMETSAT *Secretariat*

ECV Records

Atmosphere

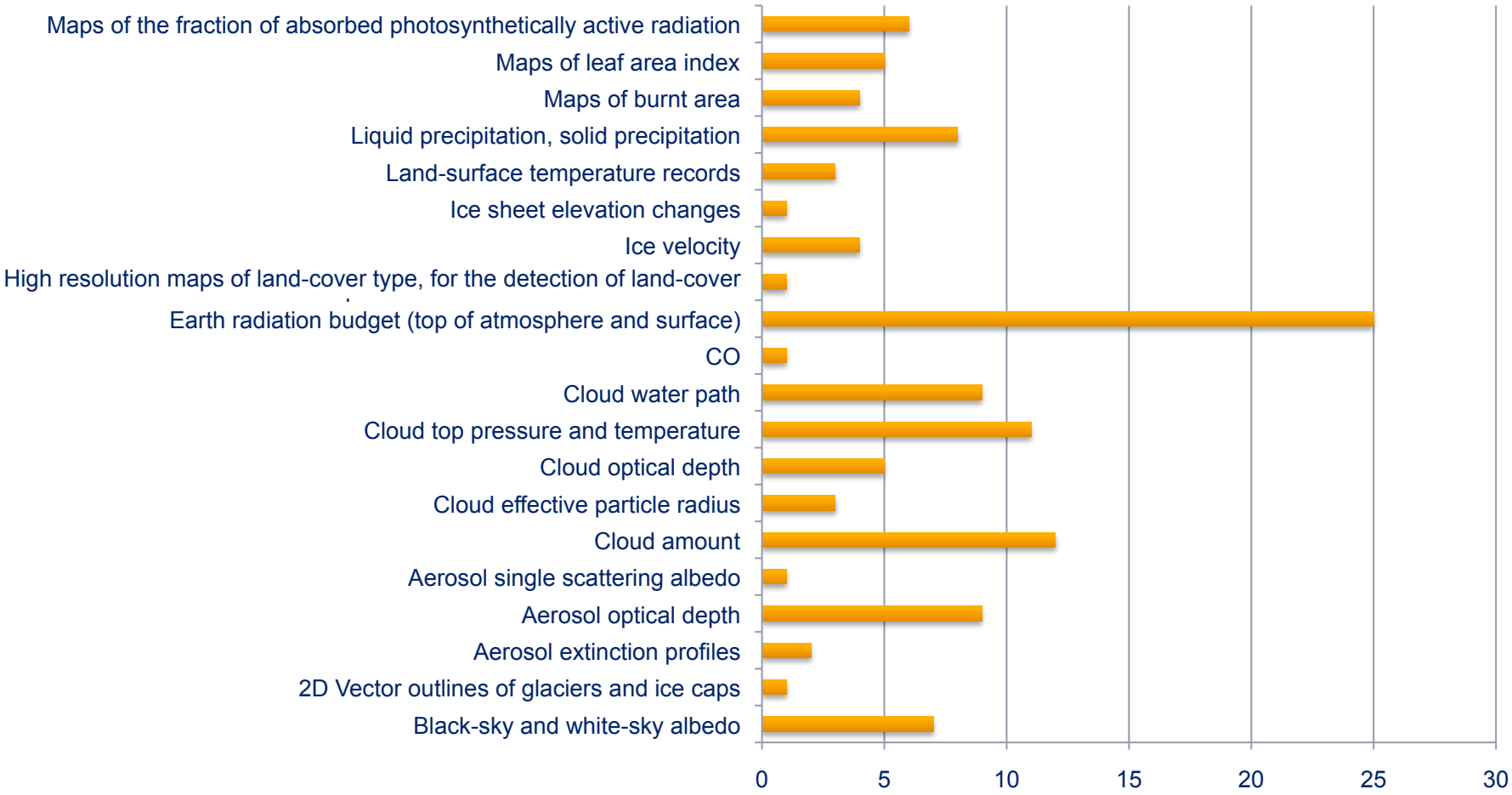
CDR_ECV01_10
CDR_ECV01_11
CDR_ECV01_12
CDR_ECV01_13
CDR_ECV01_14
CDR_ECV01_15
CDR_ECV01_16
CDR_ECV01_17
CDR_ECV01_18
CDR_ECV01_19
CDR_ECV01_20
CDR_ECV01_21
CDR_ECV01_3
CDR_ECV01_4
CDR_ECV01_5
CDR_ECV01_6
CDR_ECV01_7
CDR_ECV01_8
CDR_ECV01_9
CDR_ECV02_1
CDR_ECV02_2
CDR_ECV02_3
CDR_ECV02_4

ECV Inventory Response Received so far

- ~220 entries so far good representation across domains;
- Potential for gap analysis to distinguish what is being observed but not used;
- Initial quality control underway assessing completeness, consistency checks (incl. with MIM), domain experts broad overview;
- ECV-Inventory will remain continuously open for submissions;
- Snapshots will be taken at specific time interval and analysed.

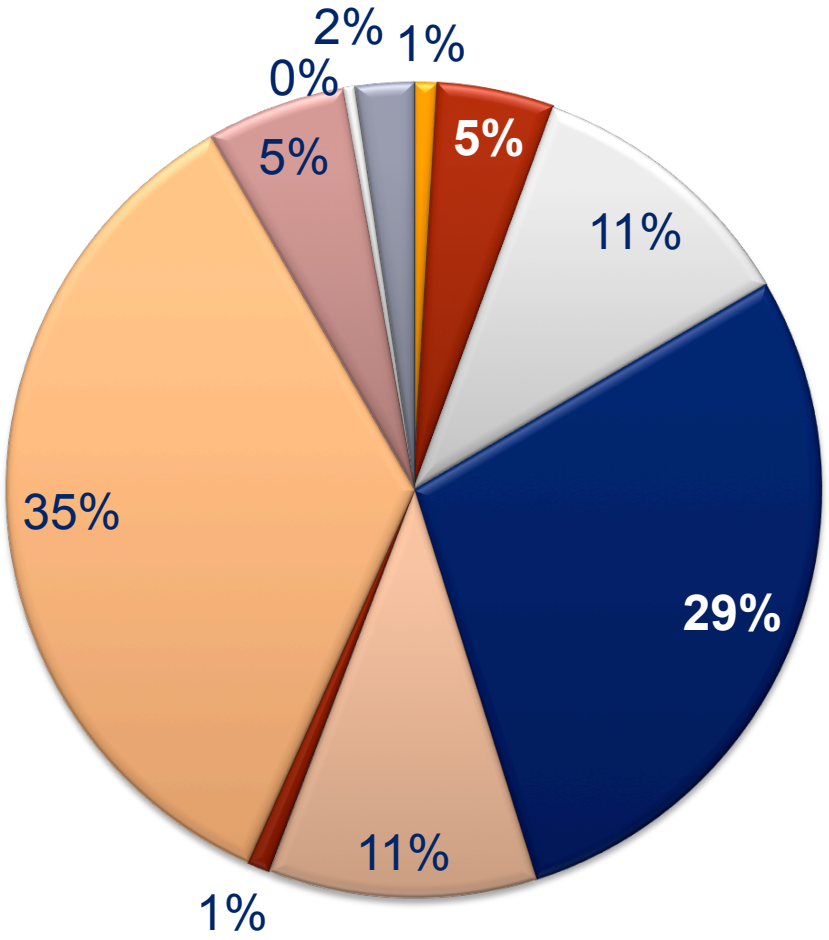
ECV Inventory Statistics: Records per TCDR

Number of Records per TCDR

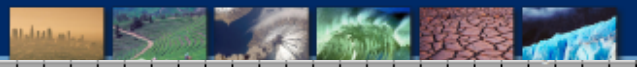


ECV Inventory Statistics – Responsible Org

- Number of records per responsible organization



ECV Inventory Statistics – TCDR Timelines



ECV Type	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Land-surface temperature														2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1		1	1	1	1	1	1					
Liquid precipitation, solid precipitation										1	1	1	1	1	1	1	1	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	6	6	6	7	4	2	1	1	1										
Maps of burnt area																									2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	1	1																					
Maps of LAI												2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	4	4	4	4	4	4	4	4	4	4	4	4	3					1	1	1	1	1	1					
Maps of the FAPAR												2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	4	4	3	4	4	4	4	4	4	4	4	3	3					1	1	1	1	1	1					
Moderate-resolution maps of land-cover type																													1	1	1	1	1	1	1	1	1	1	1	1	1	1						1	1	1	1	1	1	1	1	1	1	1
Ocean chlorophyll																												1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1						1	1	1	1	1	1					
Water leaving radiance																												5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1						1	1	1	1	1	1					
Ozone profiles										1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2														
Water vapor profiles														1	1	1	1	2	3	3	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	2	2	3	1	1	1	1	1									
Sea-ice concentration/extent/edge									1	1	1	1	1	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	1		1	1	1	1	1	2	1	1	1	1	1					
Sea-ice thickness			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1															
Sea-level																							1	5	5	5	5	5	5	5	5	5	6	6	6	6	6	6	6	6	6	2	2															
Sea-surface temperature																1	1	1	1	1	1	2	2	2	2	2	2	3	3	3	3	3	4	4	4	4	4	4	4	4	4	3	4	1	1	1	1	2	1	1	1	1	1					
Snow areal extent	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	2		1	1	1	1	1	2	1	1	1	1	1					
Soil-moisture map (up to 10cm soil depth)									1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	1	2	1	1	1	1	1										
Solid precipitation																										1	1	1	1	1	1	1	1	1	1	1	1	1	1																					
Surface wind																		8	8	8	9	10	9	9	9	10	10	12	11	12	12	11	12	12	12	12	12	11	11	11	10	10	4	2	2	1	1	1									
Total column ozone	1	1	1	1	1	1	1		1	1	1	1	1	2	2	3	3	3	3	4	4	3	3	3	3	4	4	4	4	3	4	4	4	4	4	5	5	4	4	5	4	4															
Total column water vapor																		5	6	6	6	6	6	6	6	6	6	6	7	7	7	7	7	7	7	7	7	6	6	5	3	3	3	1	1												
Upper tropospheric humidity									1	1	1	1	2	4	4	4	4	4	4	4	4	4	4	4	4	5	5	5	5	5	5	4	4	4	4	4	4	4	4	3	2	2	1	1												
Upper-air temperature									1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	5	5	5	5	4	4														
Upper-air wind										1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	2	2	1	1	1	1	1	1	1																					

ECV Inventory data analysis - ideas

- Comparative gap analysis for ECV products and sensors - missed opportunities
- Histograms comparison of length of ECV time series for “operational” and “research” agencies - myth-buster
- Identify number of agencies per ECV, comparison existing VCs – missed opportunities
- Shared responsibilities pre-launch cal, post-launch cal, validation – stewardship
- Cluster climate application field on GFCS Priorities & WCRP grand challenges - justify our existence
- Combining polar and geostationary missions: e.g. SST, precipitation, LST, albedo – missed opportunities

Links to WCRP/GCOS inventory initiatives

- There is an opportunity to consider a central “database” of ECV product metadata
- CEOS-CGMS-WMO maybe the best “resourced” opportunity for this – **BUT** this should not negate the potential for multiple interfaces to this database
- CEOS-CGMS-WMO Inventory needs to:
  - Verify consistency of GCOS/WCRP questionnaire with ECV Inventory
  - Evaluate feasibility of extending to in-situ data – This would then have to be accepted by CEOS and CGMS
  - On in-situ ultimately CEOS & CGMS could provide the infrastructure/ database but GCOS/WCRP Panels, WCRP & WMO would be responsible for soliciting in-situ contributions (i.e. handholding)

On Data Set Quality Assessments: From TOR

The CEOS Climate Working Group will:

Review and assess, on behalf of CEOS, the generation of Fundamental Climate Data Records (FCDRs) and derived Essential Climate Variable (ECV) climate products supported by Member space agencies, complementary with existing entities and roles;

What need to be done ?

- Data Set Quality Assessment of ECV Products and time series with respect to GCOS requirements

Required Steps

1. Identify expert groups (e.g. WCRP/GCOS Letter)
2. Define best practices (NOT Space Agencies)
3. Joint VC (WG) & expert group assessment teams
4. Make sure they have Adequate Resources
5. Identify appropriate body(ies) to review assessments

GCOS/WCRP Letter

GCOS
GLOBAL CLIMATE OBSERVING SYSTEM SECRETARIAT

WCRP
World Climate Research Programme

GENEVA, 12 May 2010

Dear Colleague,

We are writing because we believe that your organization can help to strengthen the international expert groups that, through scientific analysis, intercomparison and review of data records, prepare the ground for world-class climate science and sound decision-making.

Today, there is an unprecedented demand in many socio-economic sectors for relevant climate information for climate change adaptation, mitigation and risk management. Decision-makers expect this information, including related uncertainties, to be based on sound science and trustworthy data. Ensuring transparency, traceability and good scientific judgment in the generation of data records that underpin climate research and climate change monitoring has therefore become imperative.

The ICSU and UN-sponsored Global Climate Observing System (GCOS) and the World Climate Research Programme (WCRP) enjoy a long-standing partnership in the international coordination of climate science and monitoring. GCOS has, since 1992, worked closely with climate scientists and other climate information users (e.g., Parties to the UN Framework Convention on Climate Change (UNFCCC)) to ensure that their needs for high-quality data are addressed by all global Earth observing systems in the atmosphere, in the oceans, on land, and in space. Over the past three decades, WCRP has been successful in fostering the understanding and prediction of the Earth's climate system by engaging world-class climate scientists in measuring, modelling and analyzing the climate system for the benefit of science and society. WCRP also coordinates and supports the development of climate scenarios and climate model experiments and projections that are used in environmental assessments such as the Ozone, IPCC, etc. These efforts depend increasingly on long-term climate observations and records that your organization has been instrumental in establishing over the past few decades.

Since their creation, GCOS and WCRP have promoted the need for well-supported and systematic scientific data stewardship for climate data records, e.g., through advocating the provision of sufficient metadata and the publication of analyses using climate data records in the open literature (cf. Annex II). A number of international scientific groups, some quite independent of GCOS and WCRP, have been tasked by their sponsors to support these goals, many of them with an excellent track record (cf. Annex I).

However, there is currently no systematic international approach to ensure transparency, traceability and sound scientific judgment in the generation of climate data records across all fields of climate science and related Earth observations, and there are no dedicated sustained resources in place to support such an objective. For example, there are currently eight sea-ice concentration products produced by different organizations globally that differ significantly in providing an estimate of sea-ice extent and concentrations, mostly due to differences in methodology and not the variability or dynamics of underlying phenomenon. It is very confusing and frustrating for the non-experts as to which one of these products they can use in their research and analysis, and the necessary documents to

Global Climate Observing System (GCOS)
c/o WMO, 7 bis, Avenue de la Paix, CH-1211 Genève 2 - Suisse
Tel: +41 22 730 8067 – Fax: +41 22 730 8052 – http://gcos.wmo.int/
E-mail : gcosjpo@wmo.int

World Climate Research Programme (WCRP)
c/o WMO, 7 bis, Avenue de la Paix, CH-1211 Genève 2 - Suisse
Tél.: +41 22 730 81 11 – Fax: +41 22 730 80 36 – http://wcrp.wmo.int/
E-mail : wcrp@wmo.int

ECV Sea Surface Temperature	GCOS/WCRP OOPC WG SST & Sea Ice WCRP/GCOS WOAP GHRSST JCOMM DBCP JCOMM SOOP
ECV Ocean Surface Salinity	WCRP CLIVAR GSOP SMOS and Aquarius/SAC-D science teams Argo Steering Committee JCOMM SOOP
ECV Sea Level	JCOMM GLOSS CEOS OST Ocean Surface Topography Science Team
ECV Sea State	JCOMM Expert Team on Wind, Waves and Storm Surges
ECV Sea Ice	WCRP CliC ASPeCt Expert Group GCOS/GOOS/WCRP OOPC WG SST & Sea Ice JCOMM Expert Team on Sea Ice IICWG
ECV Surface Current	JCOMM DBCP CEOS OST CEOS OSVW
ECV Ocean Colour	IOCCG IOCCP CEOS OCR

Discussion on Data Set Quality Assessments

- Ultimately existence of an assessment should be indicated in the ECV Inventory but assessment itself would remain independent;
- Need to also be clear on differences between system metrics (e.g. maturity matrix) and data set quality assessments – two orthogonal axes;
- Desirable roles/responsibility:
  - Someone to provide "blueprint"/protocol for assessments, i.e. WCRP-WDAC (benefitting from experience with GEWEX, SPARC) – but with input for external expert groups;
  - Domain specific competence/scientific bodies (e.g. GHRSST, IOCCG, OST-ST, OSVW-ST) together with CEOS VCs undertake individual assessments;
  - CEOS WGClimate to ensure assessment have resources, where appropriate through CEOS member agencies;
  - GCOS/WCRP Panels to provide review of assessments.