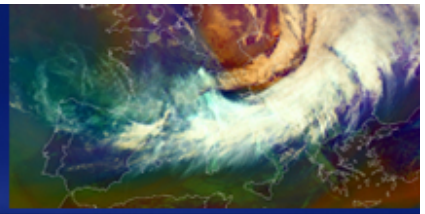
EUMETSAT Climate Related Activities Update

Jörg Schulz

34th WCRP JSC, 27-31 May 2013, Brasilia, Brazil

EUMETSAT

Current EUMETSAT Satellites

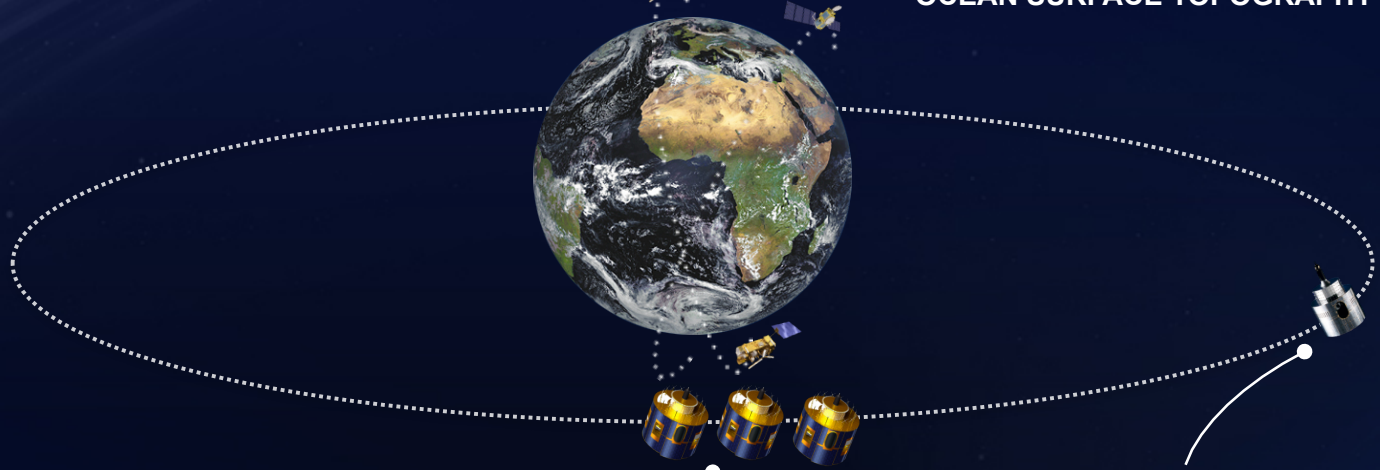


METOP A and B
(LOW-EARTH, SUN – SYNCHRONOUS ORBIT)

EUMETSAT POLAR SYSTEM/INITIAL JOINT POLAR SYSTEM

JASON-2
(LOW-EARTH, 63° INCL. NON SYNCHRONOUS ORBIT)

OCEAN SURFACE TOPOGRAPHY MISSION



METEOSAT 8-9-10 (2nd GENERATION)
(GEOSTATIONARY ORBIT)

THREE-SATELLITE SYSTEM:

- METEOSAT-10: FULL DISK IMAGERY MISSION AT 0° (15 MN)
- METEOSAT-9: RAPID SCAN SERVICE OVER EUROPE AT 9.5°E (5 MN)
- METEOSAT-8: TAKES OVER SUPER RAPID SCAN SERVICE OVER EUROPE IN SUMMER 2013

METEOSAT – 7 (1st GENERATION)
(GEOSTATIONARY ORBIT)

INDIAN OCEAN DATA COVERAGE MISSION AT 57°5 E
MISSION EXTENDED TO 2016.

EUMETSAT Climate Monitoring Implementation Plan

- EUMETSAT updated its Climate Monitoring Implementation Plan that contains:
  - ❑ The EUMETSAT Data Set Generation Plan with all records to be produced by the Central Facility and all SAFs until 2017;
  - ❑ The plan in particular covers needs for NWP model-based reanalysis;
  - ❑ It supports generation of data records contributing to 17 GCOS ECVs (10 Atmospheric, 2 Oceanic, 5 Terrestrial);
  - ❑ The Central Facility in Darmstadt has the main responsibility to create FCDRs for all EUM instruments;
- The Implementation Plan has been endorsed by the EUMETSAT Council in November 2012.


EUMETSAT

Implementation Plan - EUMETSAT Activities in Support to Climate Monitoring

Doc.No. : EUM/PPS/DOC/09/0168
Issue : v6A Draft
Date : 12 September 2012

EUMETSAT
Eumetsat-Allee 1, D-64295 Darmstadt, Germany
Tel: +49 6151 807-7
Fax: +49 6151 807 555
http://www.eumetsat.int

European Re-Analysis of Global Climate Observations

(2011-2013)

http://www.era-clim.eu/

- AVHRR Atmospheric Motion Vectors
- ASCAT Level 1 data products **LEO**
- Radio Occultation bending angles
- Combined GOME-2 & IASI ozone columns

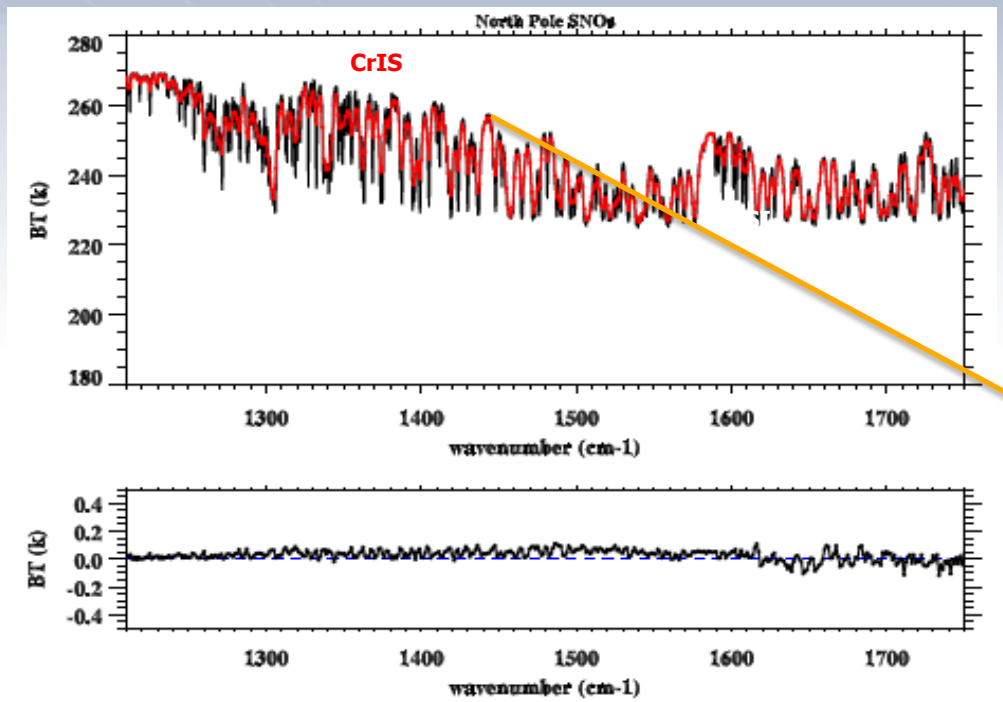
- METEOSAT Atmospheric Motion Vectors
- Clear and All Sky Radiance. **GEO**

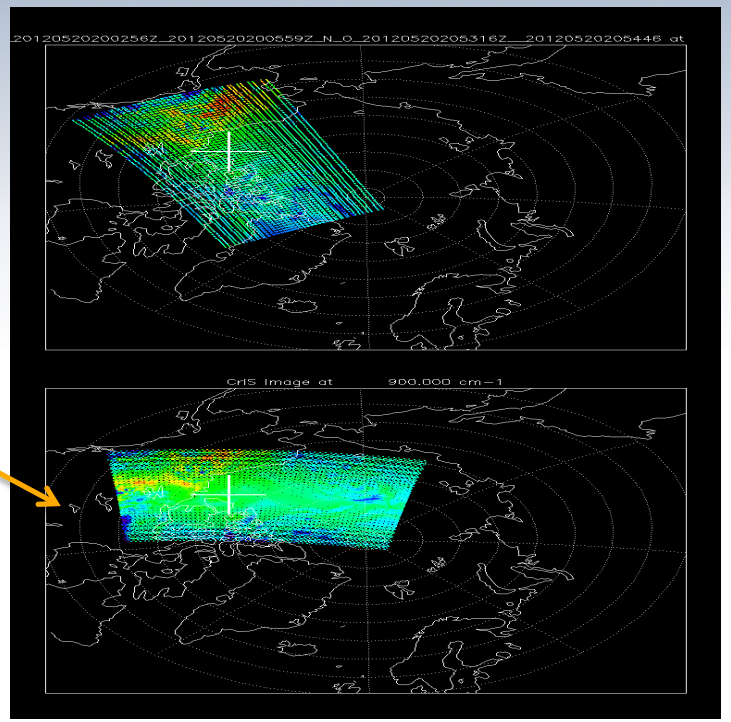
EU FP-7 ERA CLIM 2 project (2014-2016), under negotiation:

- Major elements are the consolidations of ERA CLIM data records with further improvements on calibration and algorithms, temporal extensions and further homogenisation of data records, product definitions and formats.

⇒ The EUMETSAT plan contains some flexibility to accommodate data needs from other activities.

CriS and IASI Band 2 Direct Intercomparisons





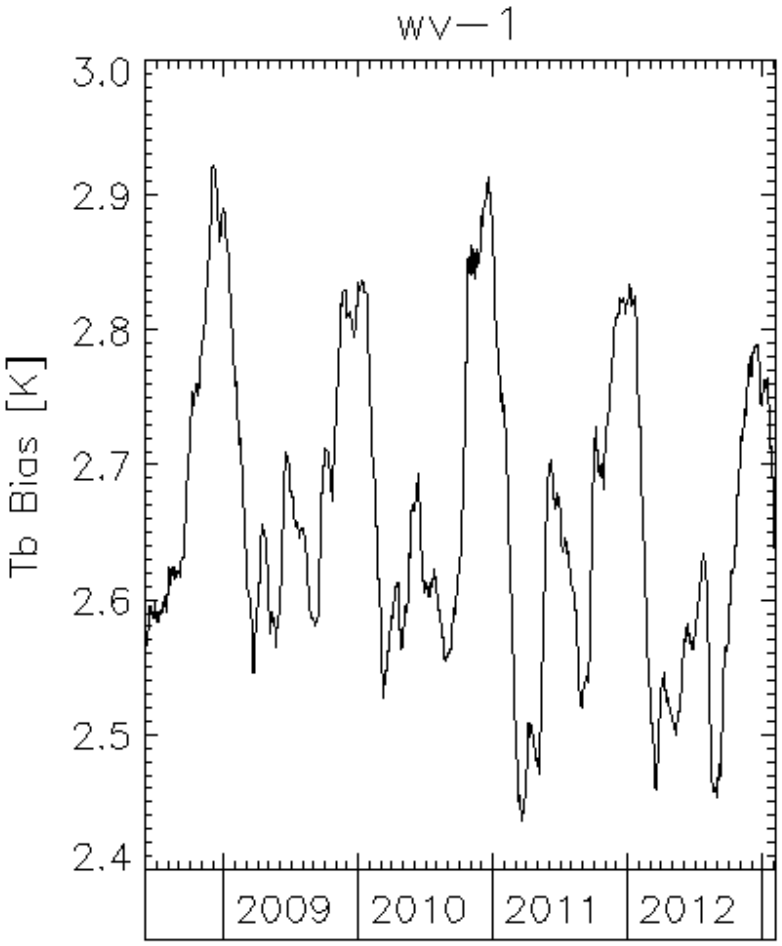
For band 2 at water vapor absorption region, CrIS and IASI are consistent to each other and the difference is close to a zero line. CrIS and IASI are nearly benchmark quality measurements and are critical for vicarious calibration of other infrared sounder and imager measurements.

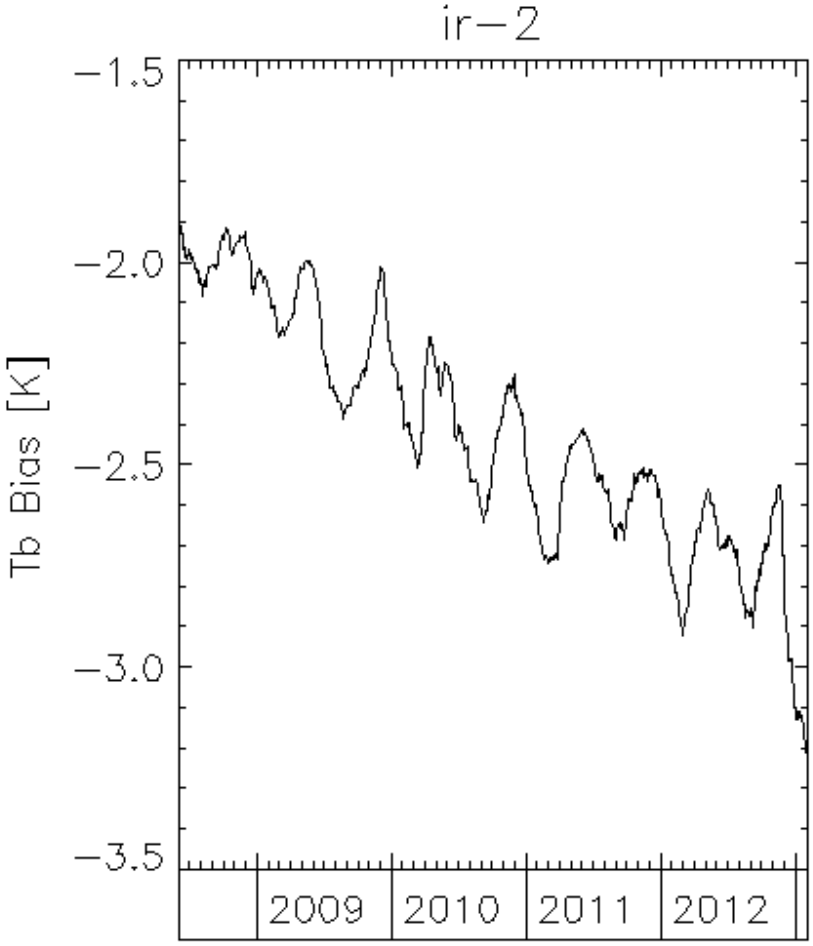
Courtesy: Mitch Goldberg, NOAA

GSICS Global Space-based Inter-Calibration System

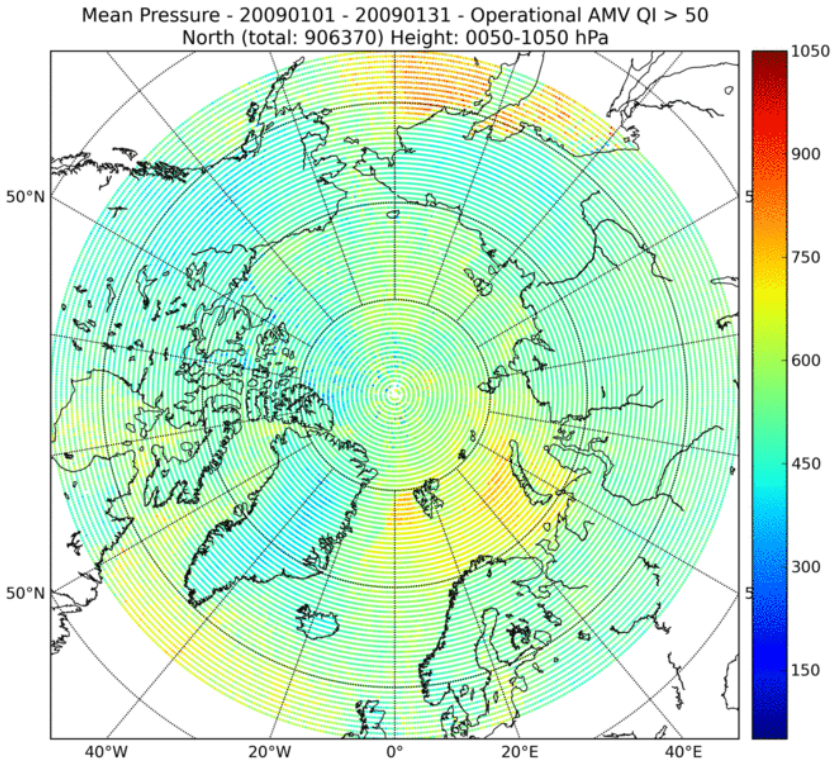
EUMETSAT

METEOSAT-7 MVIRI vs. IASI Metop-A

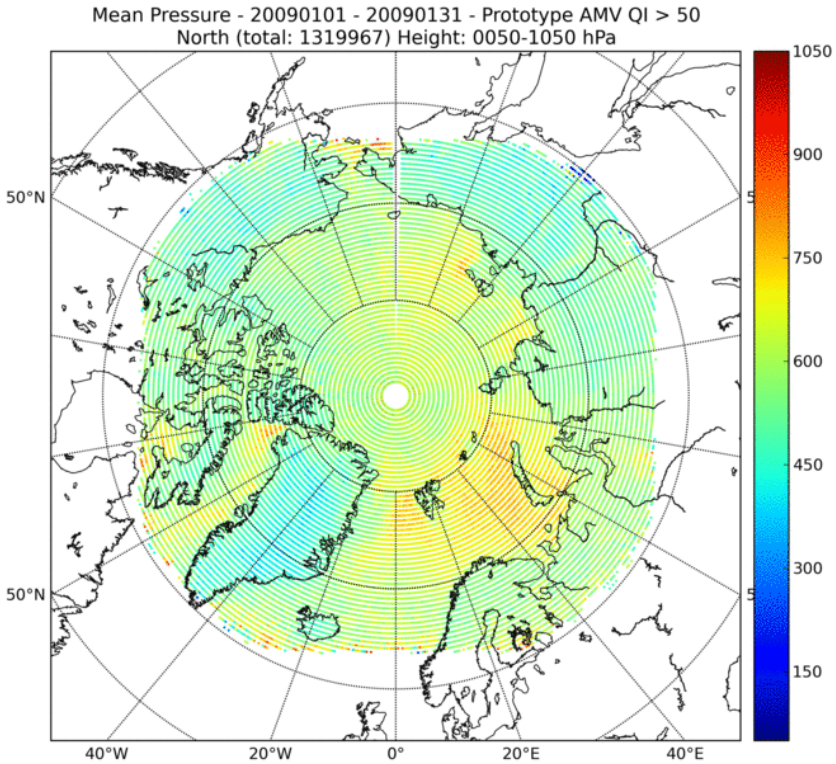




Monthly average AMV height (pressure) – Jan 2009



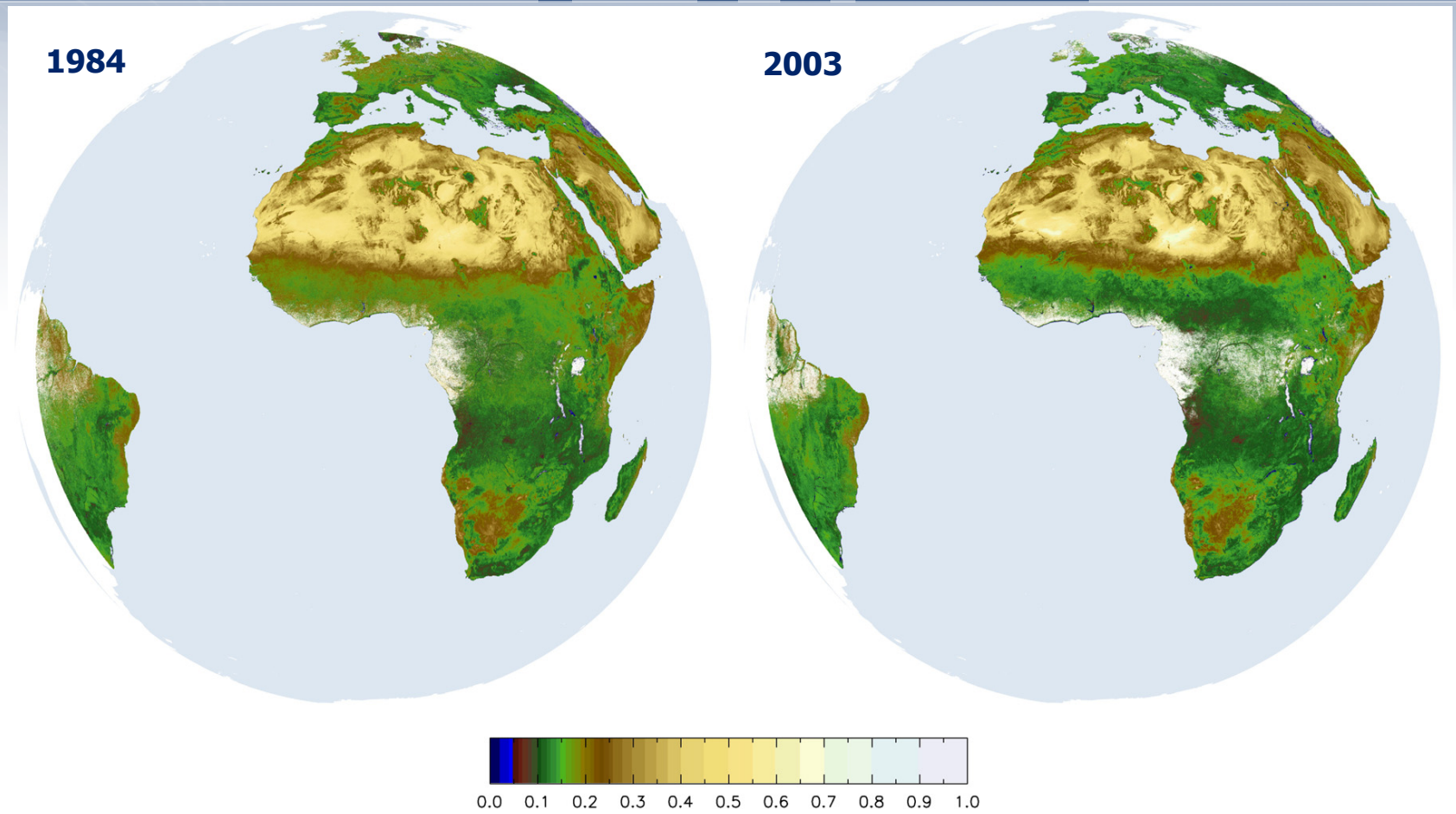
EUM - Operational



EUM – based on CIMSS

CRACLIM EUMETSAT

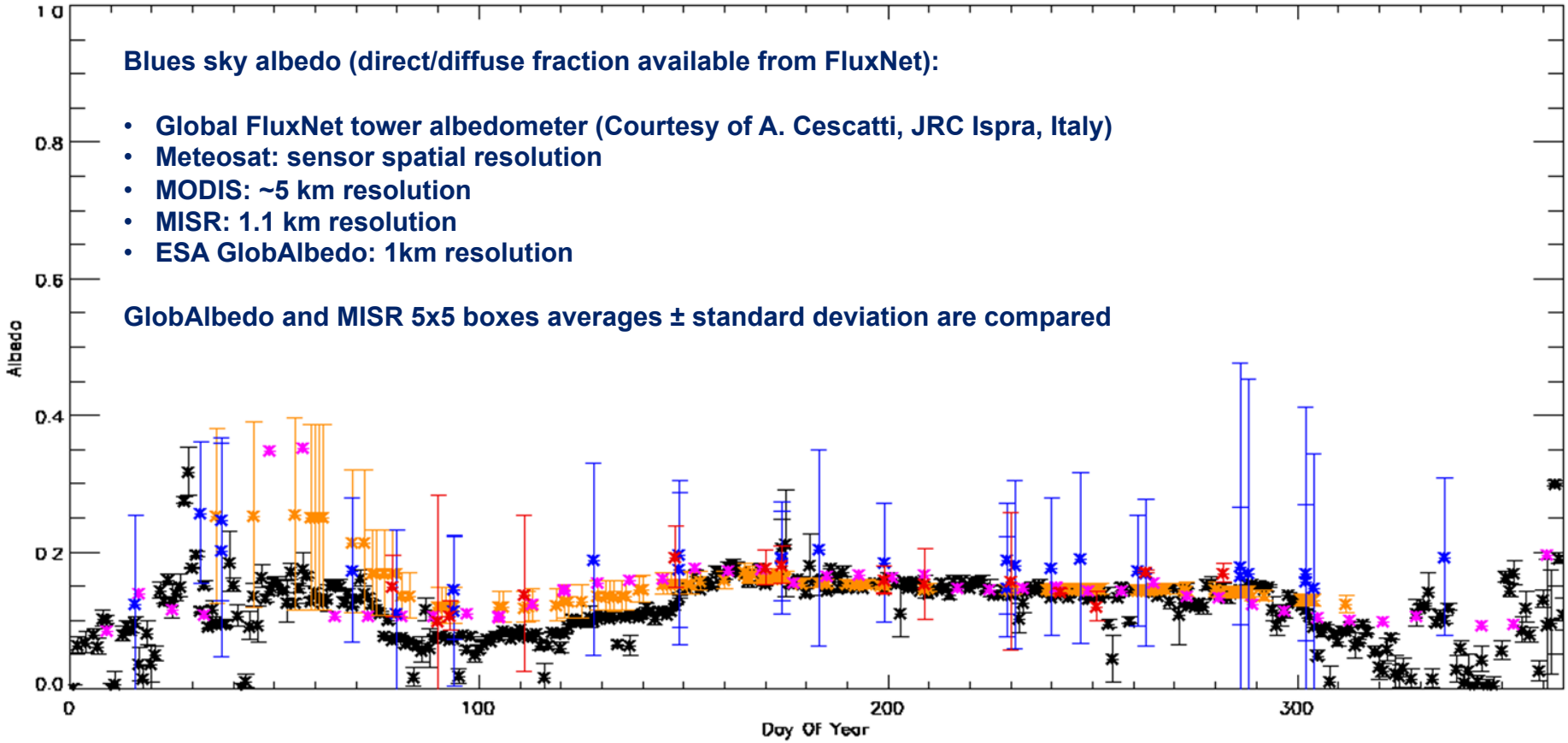
Climate Change Monitoring: Surface Albedo Using Meteosat



Mean broadband surface albedo derived from Meteosat observations for the August–October (ASO) period for year 1984 (left) and 2003 (right). Unprocessed data are shown in white to the exception of oceans which are shown in light blue. Products available from www.eumetsat.int.

Validation of Geostationary Surface Albedo

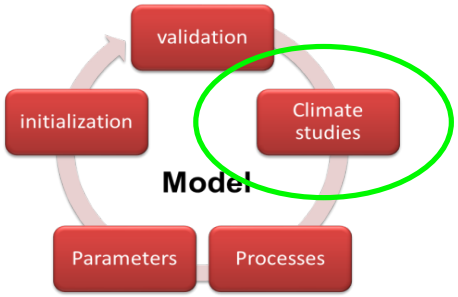
Hainich (near Jena), Germany, 2005, deciduous broadleaf forest



ESA GlobAlbedo MODIS (MCD43C3) MISR EUMETSAT Meteosat-7 FluxNet Tower

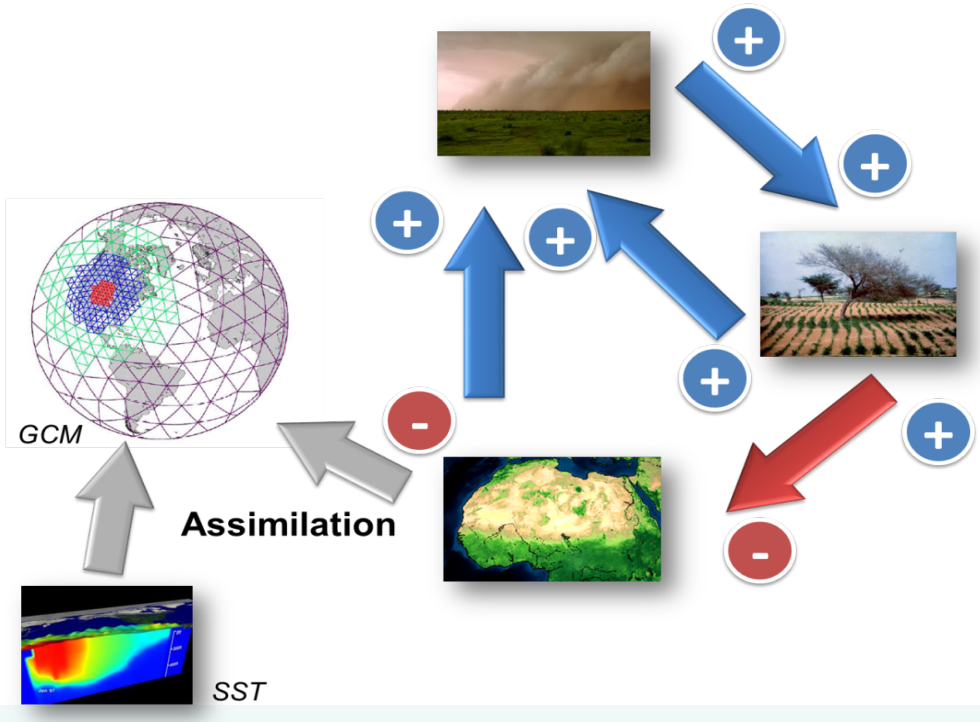
EUMETSAT

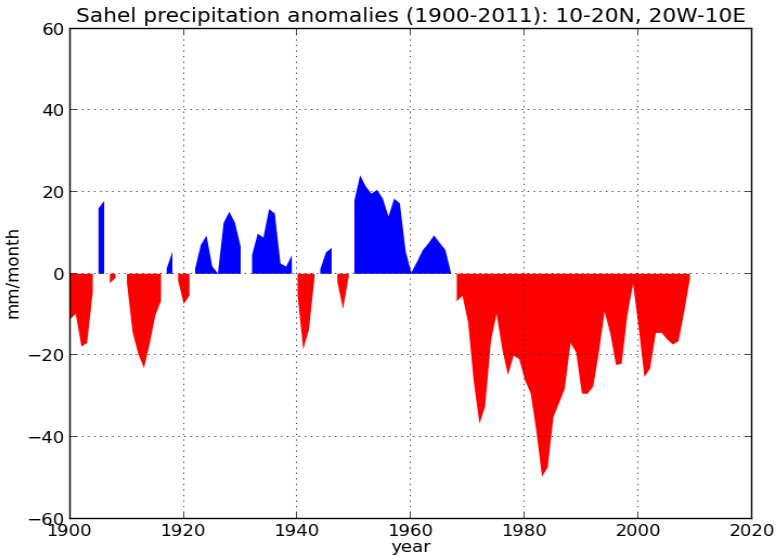
From observations to information



New opportunities in climate modelling using long-term satellite observations

Example Sahel drought: how does the land surface affect droughts?

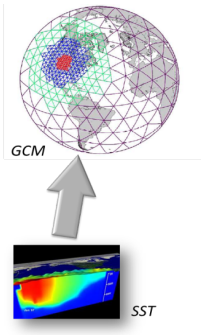


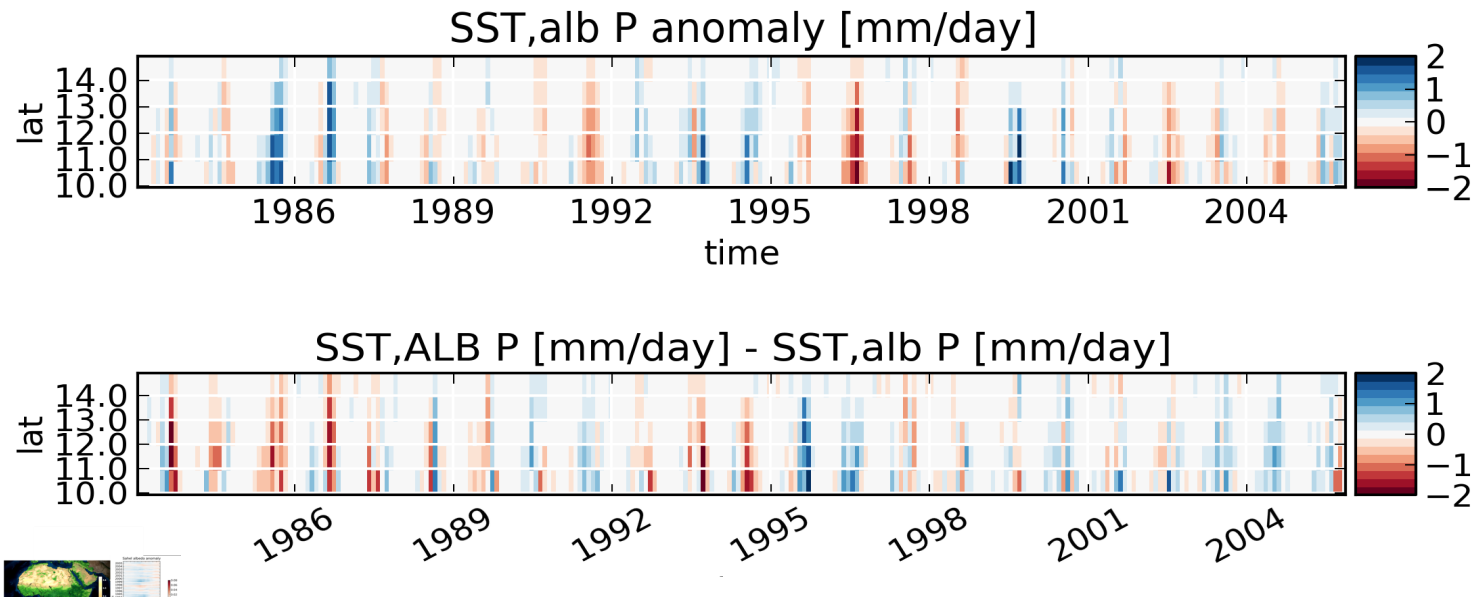


Courtesy of Alexander Loew, MPI-M, Hamburg, Germany

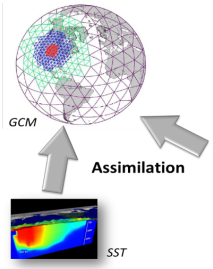
Assimilation of EUMETSAT albedo observations in ECHAM

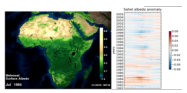
... results in more realistic precipitation variability





Model





Model

Observations

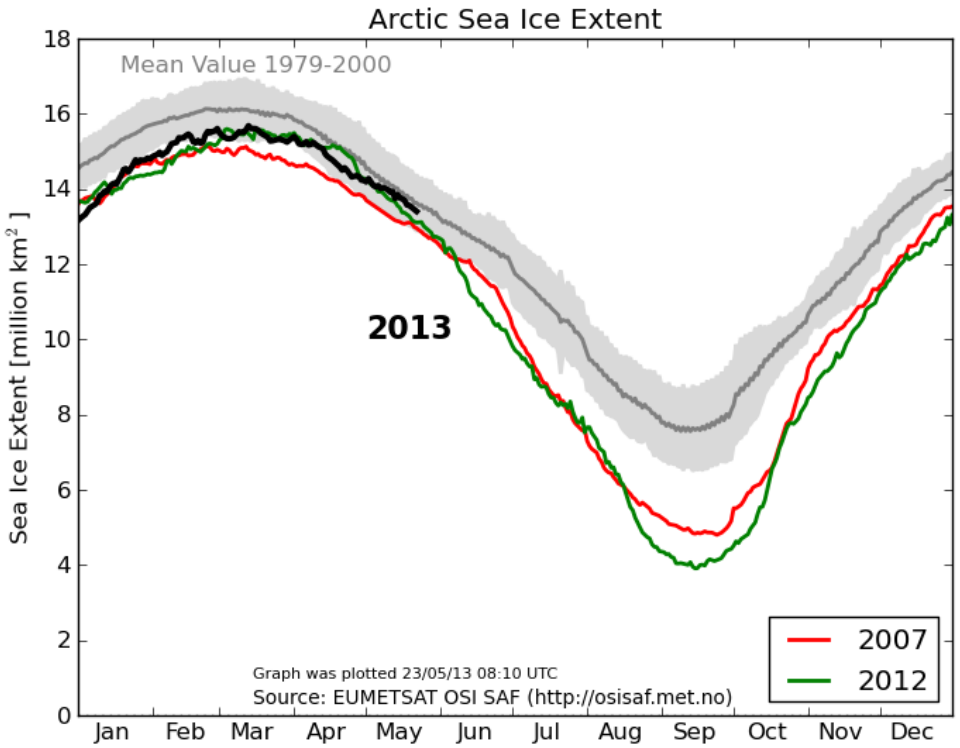
Courtesy of Alexander Loew, MPI-M, Hamburg, Germany

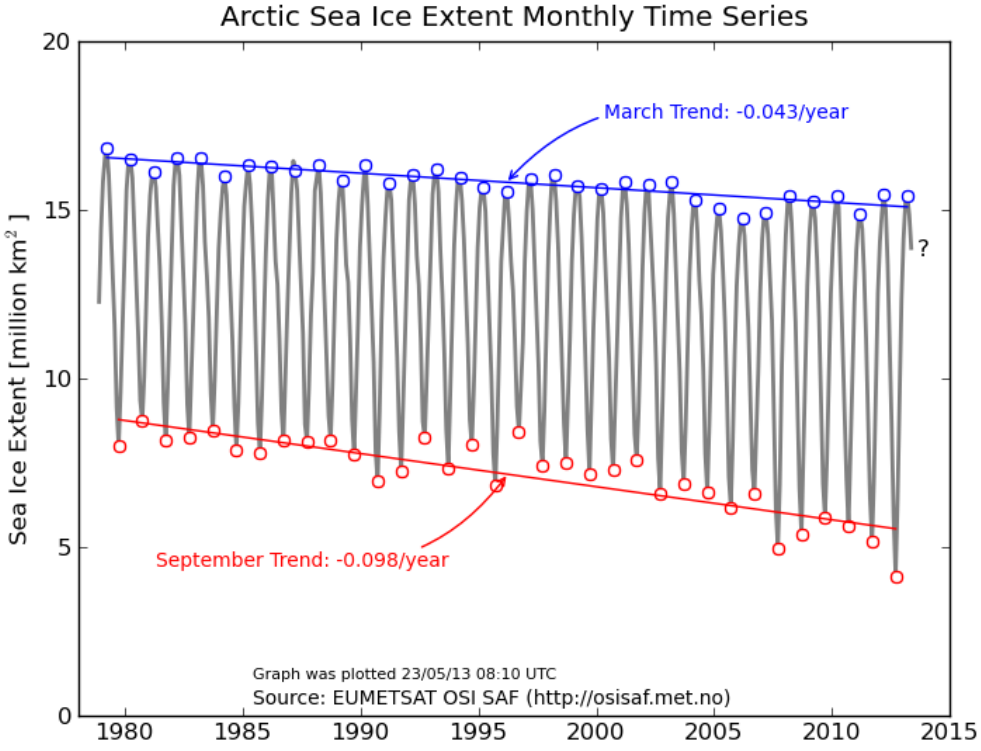
Hagemann & Loew, 2012, JAMES

New Projects on Surface Albedo

- The shown climate studies ask for global high resolution products with longest possible record lengths;
- Space agencies and research institutes in Europe have agreed 3 new projects:
  - SCOPE-CM Phase 2: EUM, NOAA and JMA started project on all geostationary satellite albedo project (2014-2019), covers all geostationary satellites where VIS channels can be calibrated well enough;
  - EC FP7 funded QA4ECV: Develops traceable uncertainty estimates along the example of a geostationary/polar orbiting combined global surface albedo record. Will use results from the SCOPE-CM project and VEGETATION, MERIS, MODIS and MISR data to produce global high resolution surface albedo record;
  - SCOPE-CM Phase 2: CM SAF and NOAA, U. Boston started project on joint MODIS/AVHRR surface albedo.

Climate Change Monitoring: Arctic Sea Ice

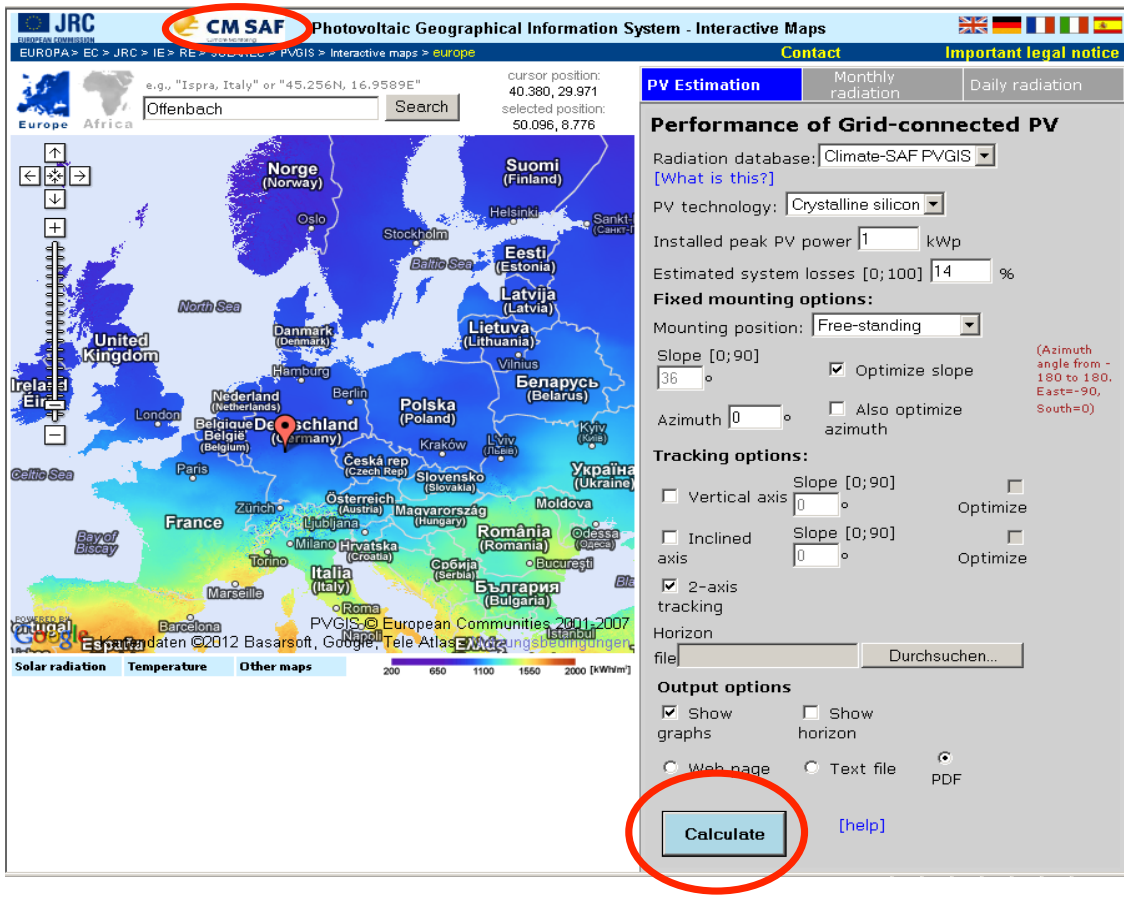




OSI SAF
Ocean and Sea Ice

Application: Solar Energy Yield

PV GIS: Photovoltaic Geographical Information System, JRC:
http://re.jrc.ec.europa.eu/pvgis/



Performance of Grid-connected PV

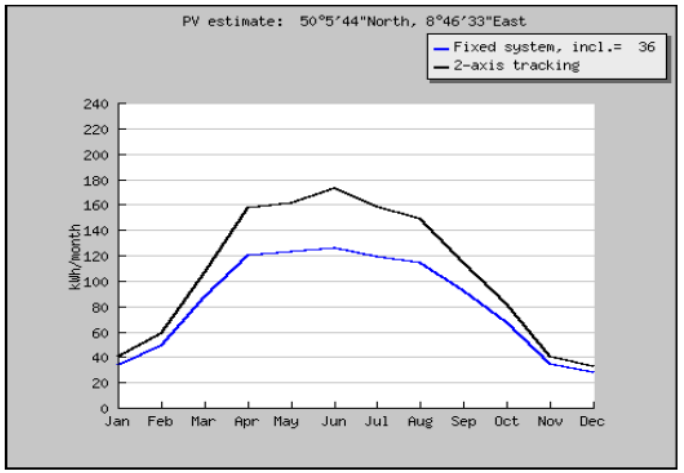
PVGIS estimates of solar electricity generation

Location: 50°5'44" North, 8°46'33" East, Elevation: 108 m a.s.l.,
Solar radiation database used: PVGIS-CMSAF

Nominal power of the PV system: 1.0 kW (crystalline silicon)
Estimated losses due to temperature: 7.9% (using local ambient temperature)
Estimated loss due to angular reflectance effects: 2.9%
Other losses (cables, inverter etc.): 14.0%
Combined PV system losses: 23.1%

	Fixed system: inclination=36 deg., orientation=0 deg. (Optimum at given orientation)			
Month	Ed	Em	Hd	Hm
Jan	1.09	33.7	1.29	40.0
Feb				
Mar				
Apr				
May				
Jun				
Jul				
Aug				
Sep				
Oct				
Nov				
Dec				
Year				
Total year				

	2-axis tracking system			
Month	Ed	Em	Hd	Hm
Jan	1.30	40.2	1.54	47.6
Feb	2.10	58.9	2.56	71.6
Mar	3.45	107	4.28	133
Apr	5.25	158	6.72	202
				212
				230
				212
				198
				150
				103
				49.1
				38.5
				137
				1650



Ed:
Em:
Hd:
Hm:

h/m2)
!)

Huld et al., Solar Energy, 86, 1803 – 1815, 2012

CGMS High Level Priority Plan

- The CGMS high level priority plan (http://www.cgms-info.org/docs/general-publications/cgms-high-level-priority-plan-2013-2017.pdf?sfvrsn=0) has been endorsed by the 40th CGMS plenary meeting in November 2012.
- This rolling 5-year (2013-2017) plan is seen as part of a longer term perspective, in particular as regards the new challenges raised by climate monitoring in the context of the implementation of the Global Framework for Climate Services.

- It will be reviewed on an annual basis, considering in particular new requirements and perspectives arising from interactions with the user and scientific communities, the development of applications, e.g. NWP, and relevant research activities.
- It will ensure proper interaction with other space agencies and their relevant constituencies (e.g. CEOS including its working groups and virtual constellations).

Coordination Group for Meteorological Satellites

INTERNATIONAL ATOVS WORKING GROUP

CGMS IPWG International Precipitation Working Group

IWWG

CGMS

Top-level priority 5.1: Advancing the architecture for climate monitoring from space

- **« Advancing the Architecture» a major header in CGMS HLPP:**
  - Take an active role in building up the architecture as a contribution to GFCS
  - Evaluate the CGMS baseline against the logical view
  - Extend the Global Space-based Inter Calibration System (GSICS) and the Sustained, Co-Ordinated Processing of Environmental Satellite Data for Climate Monitoring (SCOPE-CM);
  - Analyse long-term datasets , assess impact on climate applications;
  - Establish priorities for multi-decadal ECV products;
  - Contribute to creation of key FCDRs supporting many ECVs;
  - Ensure systematic contribution to the ECV inventory;
  - Integrated access to climate data records of CGMS members;
  - Common approach to long-term data preservation;
  - Work with CEOS.

SCOPE-CM Phase 2 Projects

- Call for SCM-Project issued December 2012, 10 LoI received and accepted, projects will start January 2014:
  - GEO tapestry consistent inter-calibrated geostationary radiance data record (FCDR) employing GSICS methodology [EUM, EUM/CM-SAF, JMA, NOAA, (other agencies may join later)];
  - AVHRR FCDR generation [EUM/CM-SAF, NOAA, ESA];
  - Atmospheric Motion Vectors (2 projects) [JMA, ECMWF, EUM, EUM/CM-SAF, NOAA, IMD];
  - Continuation of ISCCP [NOAA, CMA, EUM, INPE, JMA, City College NY];
  - Surface Albedo (geostationary and polar platforms (2 projects) [EUM, EUM/CM-SAF, JMA, NOAA, U. Mass. Boston];
  - Microwave Cloud Liquid Water Path (LWP) [CIMSS&AOS/U. Wisconsin, CIRA&ATS/Colorado State University, EUM/CM-SAF];
  - Free Tropospheric Humidity (GEO and LEO sensors) [NOAA, EUM/CM-SAF, T.U. Luleå, Met Office, NCAR, U. Miami];
  - Radio Occultation Trend analysis [DMI, ECMWF, EUM, GFZ, JPL, Met Office, Moog, UCAR, WEGC].

Big jumps with empty pockets