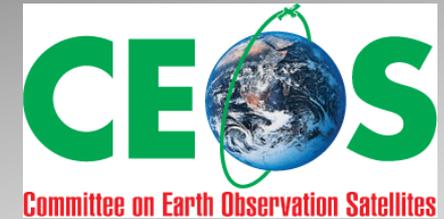


Task AR-09-02a



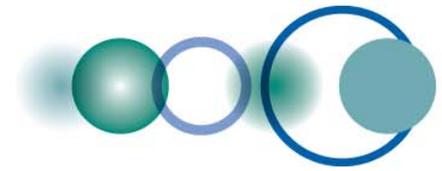
Virtual Constellations (VC)

Prepared by

VC co-Leads (CEOS Agencies)
Ivan Petiteville (CEOS/ESA)
Osamu Ochiai (CEOS/JAXA)

*GEO Task Symposium,
Pretoria, 17-19 May 2010*





Task Description

- Development of **Virtual Constellations** for GEO within CEOS framework in consultation with User Communities
- **Objectives:**
 - Improve the temporal, spatial and spectral coverage & resolution as well as data management and dissemination
 - Satisfy the requirements and objectives of the GEO SBAs



Atmospheric Composition (ACC)

To collect and deliver data to improve monitoring, assessment, and predictive capabilities for changes in ozone, air quality, and climate.

Land Surface Imaging (LSI)

To determine optimal capabilities to acquire, receive, process, archive, and distribute land surface image data to the global user community.

Ocean Colour Radiometry (OCR)

To provide long time series of calibrated ocean colour radiance (OCR) at key wavelength bands from measurements obtained from multiple satellites.

Ocean Surface Topography (OST)

The implementation of a sustained, systematic capability to observe the topography of the surface of the global oceans ranging from basin-scale to mesoscale.

Ocean Surface Vector Wind (OSVW)

Promote the widespread use of scatterometer-derived surface vector winds (SVW) and altimeter-derived significant wave heights (SWH) in operational marine analyses and forecasts worldwide, as a contribution to the protection of life and

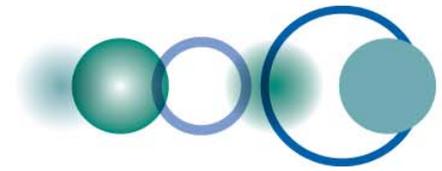
Precipitation (PC)

To guide, facilitate, and coordinate continued advancements of multi-satellite global precipitation missions.



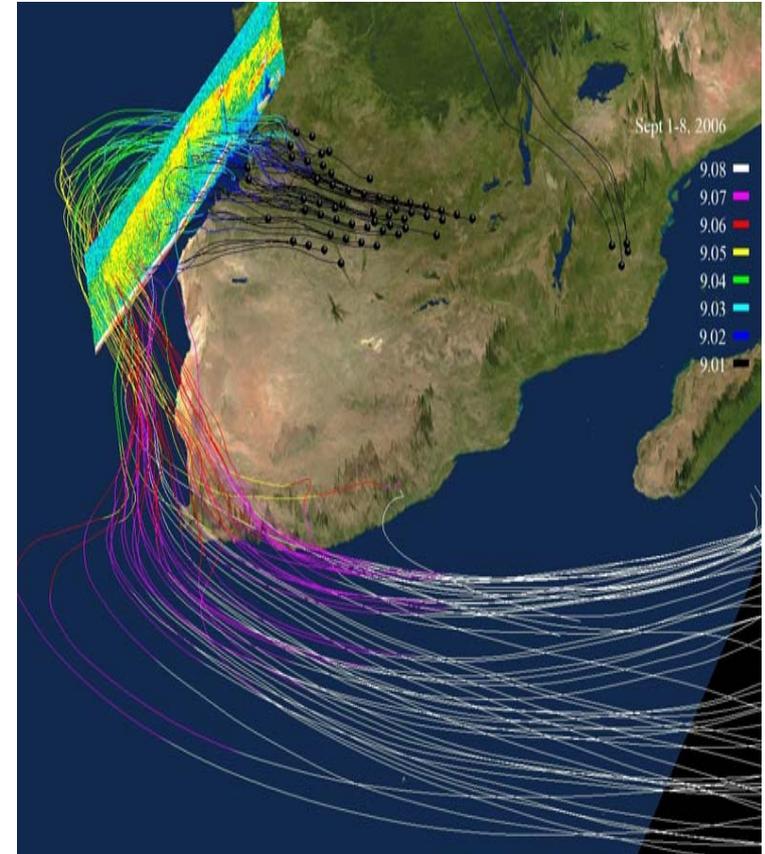
CEOS Virtual Constellations Co-Leads

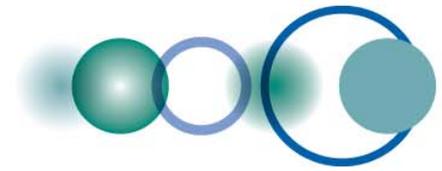
- **Atmospheric Composition (ACC)**
 - Richard Eckman, NASA
 - Claus Zehner, ESA
- **Land Surface Imaging (LSI)**
 - Tom Holm, USGS
 - V.S. Hegde, ISRO
- **Ocean Colour Radiometry (OCR)**
 - Mark Dowell, JRC
 - Hiroshi Murakami, JAXA
 - Paula Bontempi, NASA
 - James Yoder, IOCCG/WHOI (support)
- **Ocean Surface Topography (OST)**
 - François Parisot, EUMETSAT
 - Stan Wilson, NOAA
- **Ocean Surface Vector Wind (OSVW)**
 - Hans Bonekamp, EUMETSAT
 - Stan Wilson, NOAA
 - B.S. Gohil, ISRO
- **Precipitation (PC)**
 - Steven Neeck, NASA
 - Riko Oki, JAXA



4 projects involving several CEOS members and multiple satellites

- **Air Quality** (NOAA/Eumetsat/NASA)
 - Nitrogen Dioxide (NO₂) Air Quality Forecasts
 - Project successfully completed, Metop and Aura intercalibration resolved and six month data set produced (HE-09-03a)
- **Smoke dust Forecast** (NASA, NOAA, and EPA collaboration)
 - Automated fire detection algorithm for MODIS
 - Employ trajectory model to predict distribution and location and smoke
 - Possibly include vertical aerosol distribution from CALIPSO
 - Demonstration complete, Proposal to US-GEO (HE-09-01)
 - Extend to MSG/SEVIRI (Eumetsat)





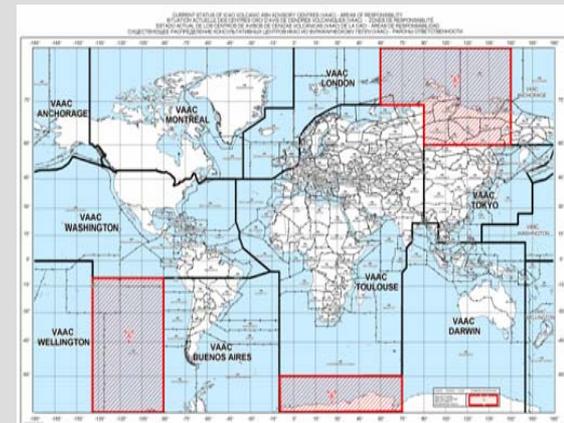
• ACC Data Portal

- Will serve forecasters, assessment, climate users: **Ozone, Air Quality, Climate**
- Provide data access, tools, services and guidance to investigators and value-adding organizations
- Contribute to GEO AIP (Community Node) and adhere to OGC standards (**AR-09-01b**)
- One year demonstration project is underway by NASA/DLR



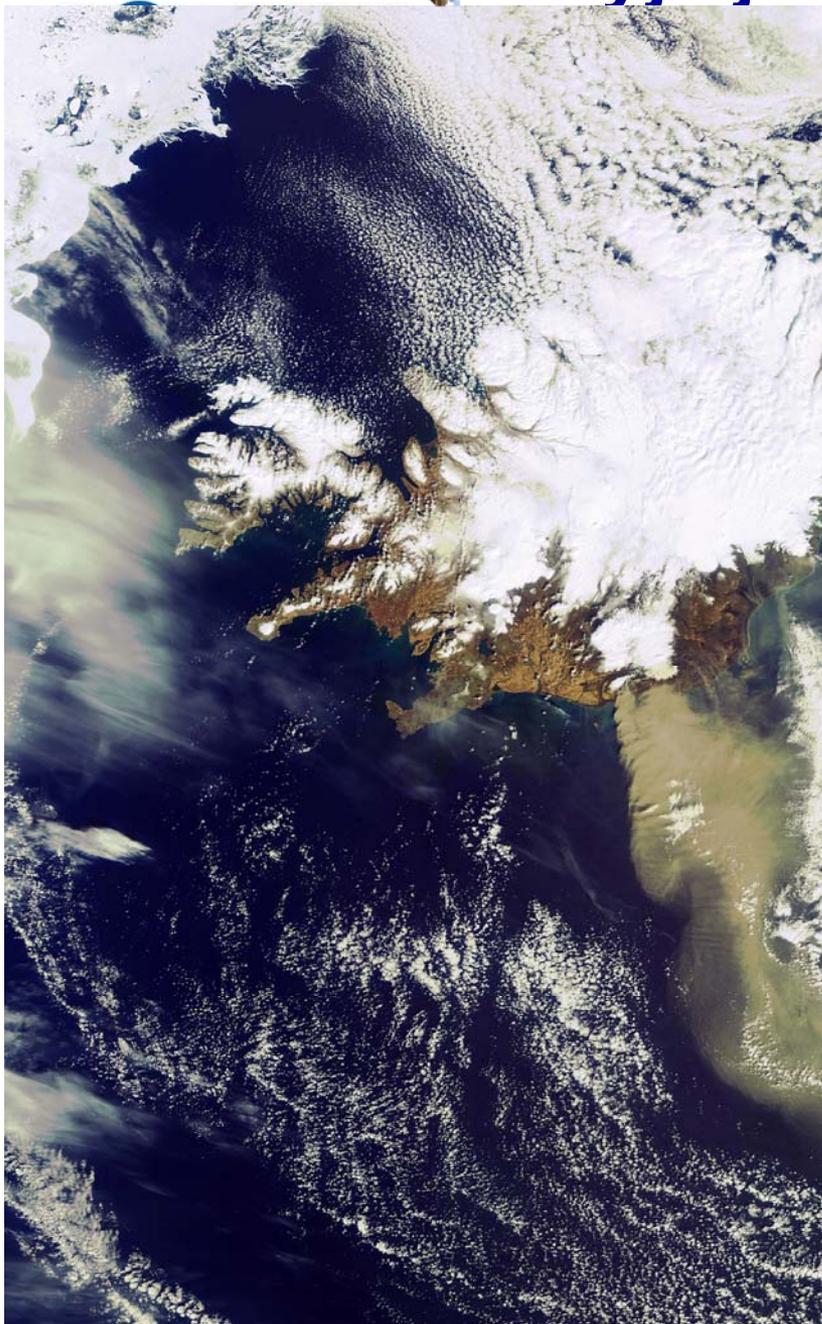
• Volcanic Alerts - ESA/NOAA/NASA

- Demonstrate a global operational volcanic ash alert system for aviation hazard avoidance.
- Operational with improvements underway. Workshop in Rome 6-7 April 2009.
- Oslo meeting in Sep-09 to complete definition phase.
- Completion of two 14-month demo phases due in Jan-2012. (**DI-09-02a**)



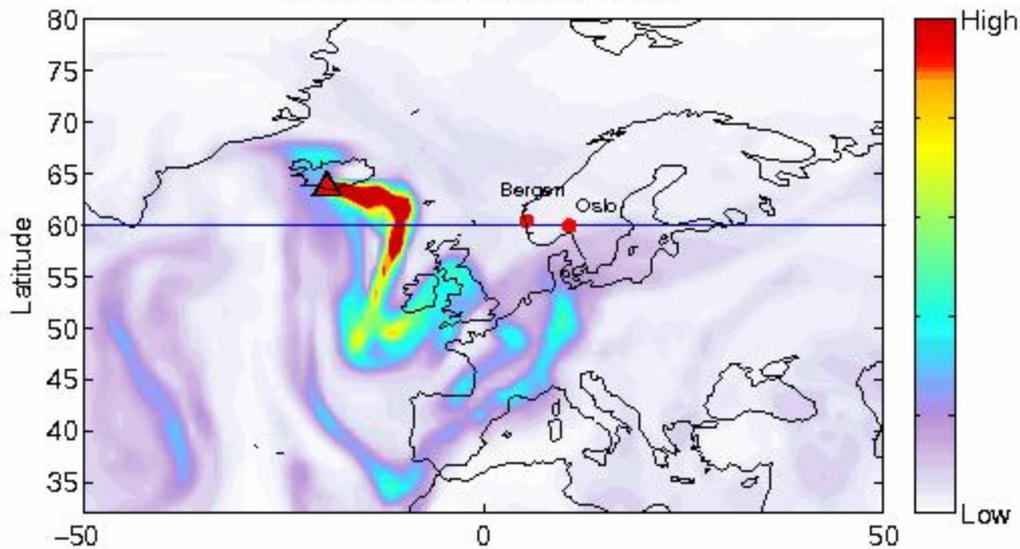


Eyjafjall



Volcanic emissions from Eyjafjallajökull eruption

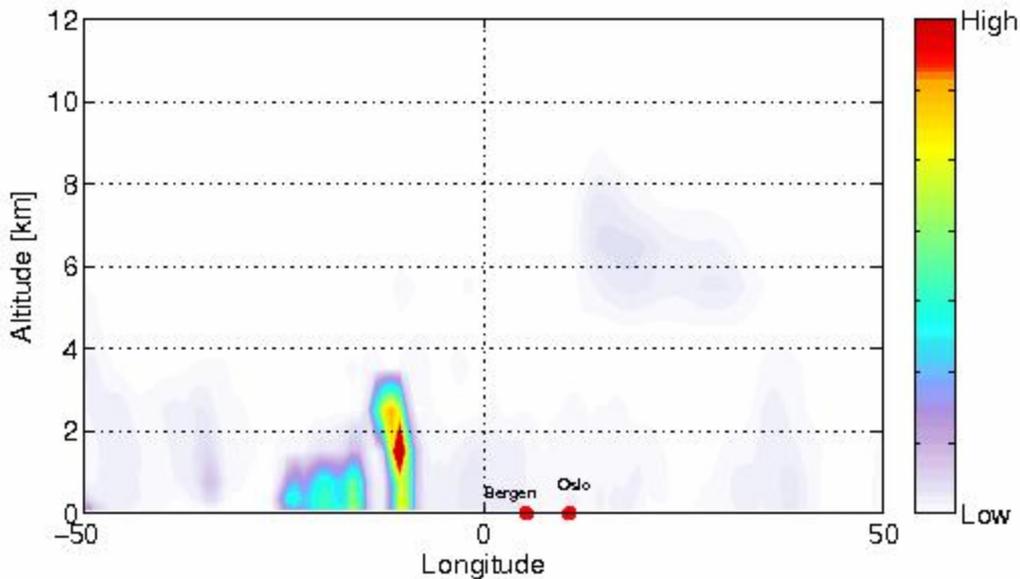
Date: 05.03.2010 09:00 UTC

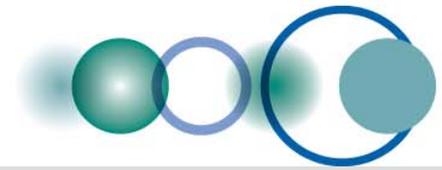


Updated: 03.05.2010 09:30 UTC

Norwegian Institute for Air Research

From SEVERI (Meteosat 9)

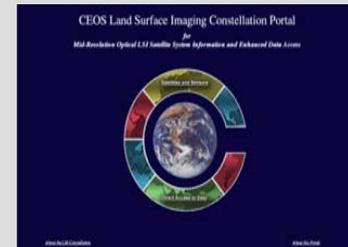




• LSI Constellation Portal:

“Mid-Resolution Optical Land Surface Imaging Satellite Systems” -- Information and Enhanced Data Access

- Now online at <http://wgiss.ceos.org/lcip>
- Access to data from 28 satellites from CEOS space agencies



Landsat Imagery Database | Home | Database | e029s27

Global Forest Resources Assessment
Food and Agriculture Organization of the UN
GISCE, South Dakota State University

e029s27 | Imagery | Auxiliary data

Location
27° S; 29° E
Africa; **South Africa** (Mpumalanga)
Elevation of the tile center point: 1489 m
Water consist 0.5% of block area

Biome/ ecoregion
Montane Grasslands & Shrublands biome
Highveld grasslands ecoregion

External information resources
The Degree Confluence Project information

Title outlines
 ↓ Tile outline 10x10km and 20x20km [KMZ]
 ↓ Tile outline 10x10km [SHP]
 ↓ Tile outline 20x20km [SHP]

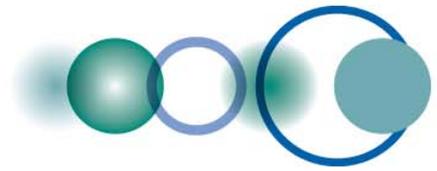
Landsat TM (1990)	Landsat ETM+ (2000)	Landsat ETM+ (2005)
 Path: 169; Row: 079 Date: 1989/03/09 Data within tile: 100.0 Cloud cover: 0.0 NDVI at image date: 95% of annual maximum ↓ Download image data [zip]	 Path: 169; Row: 079 Date: 2002/01/16 Data within tile: 100.0 Cloud cover: 0.1 NDVI at image date: 99% of annual maximum ↓ Download image data [zip]	 Path: 169; Row: 079 Date: 2005/05/16 Data within tile: 98.0 Cloud cover: 0.0 NDVI at image date: 52% of annual maximum ↓ Download image data [zip]
 Path: 170; Row: 079 Date: 1991/04/07 Data within tile: 100.0 Cloud cover: 0.0 NDVI at image date: 76% of annual maximum ↓ Download image data [zip]	 Path: 170; Row: 079 Date: 2001/02/05 Data within tile: 100.0 Cloud cover: 0.0 NDVI at image date: 100% of annual maximum ↓ Download image data [zip]	 Path: 170; Row: 079 Date: 2007/02/22 Data within tile: 100.0 Cloud cover: 0.0 NDVI at image date: 98% of annual maximum ↓ Download image data [zip]

Important notices | Contacts | Dataset description

•FAO Forest Resources Assessment 2010 (FRA 2010) Project (EC-09-01)

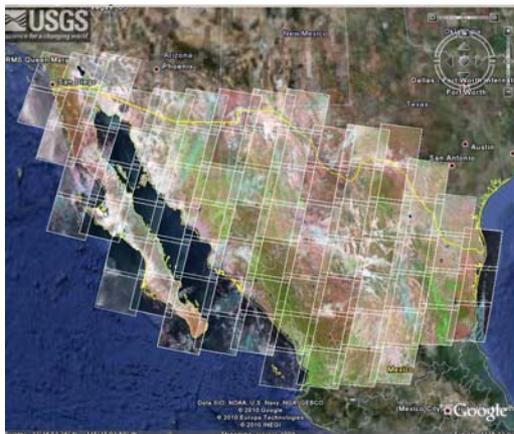
more than 13000 Landsat images available

FRA 2010: images over South-Africa

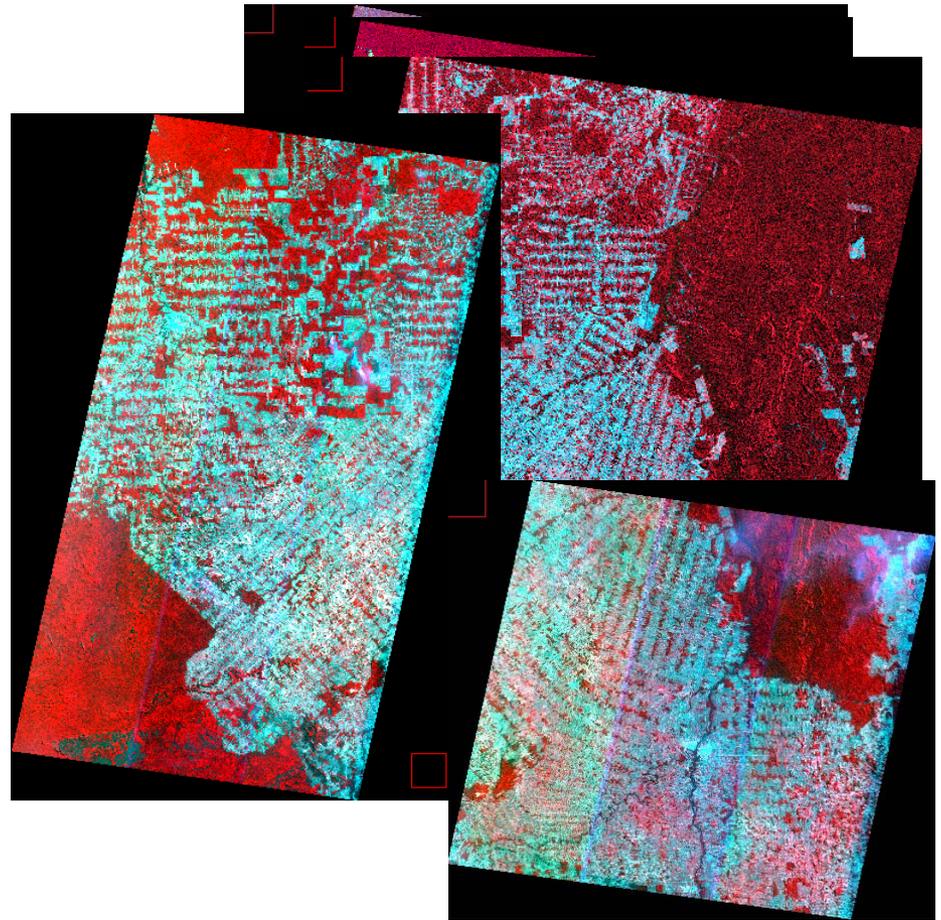


- **Optical Support to FCT** (CL-09-03b):

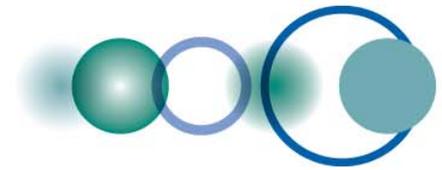
- Coordinated satellite data acquisition effort by CEOS agencies in 2009 with continued support in 2010.
- **More than 6300 optical scenes** in 2009 (Landsat 5 & 7, CBERS-2B)



549 Landsat TM over Mexico



Deforestation Brazil 76-07



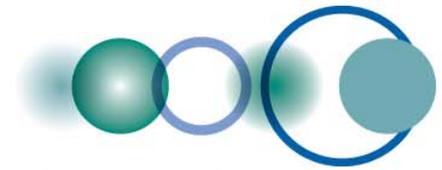
Timely implementation of the Global Precipitation Measurement (GPM) mission and encourage more nations to contribute to the GPM constellation

Accurate and timely global precipitation data record including a Fundamental Climate Data Record essential for understanding the integrated weather/climate/ecological system, managing freshwater resources, and monitoring and predicting high-impact natural hazard events.

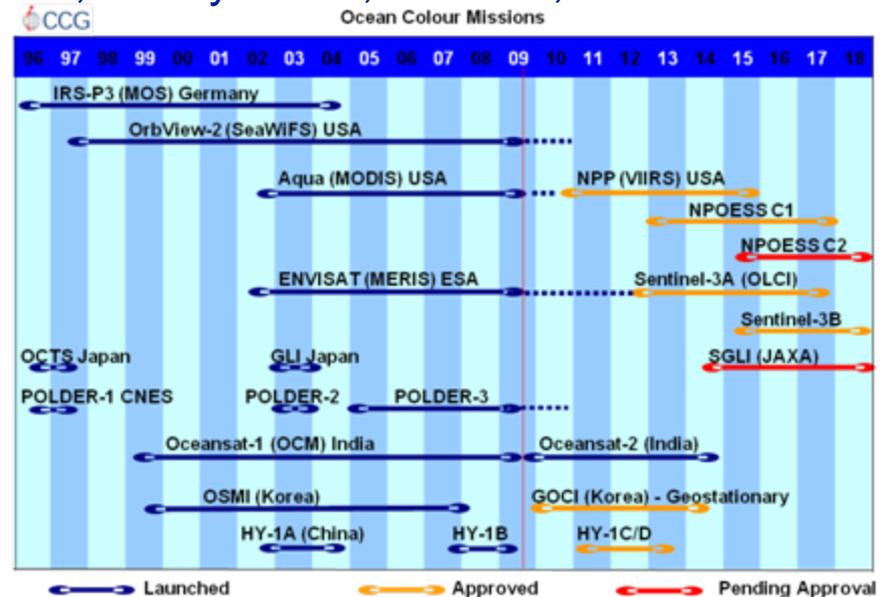


Prototype flood monitoring and landslide warning products from Tropical Rainfall Measuring Mission (TRMM) data will be improved and made available operationally

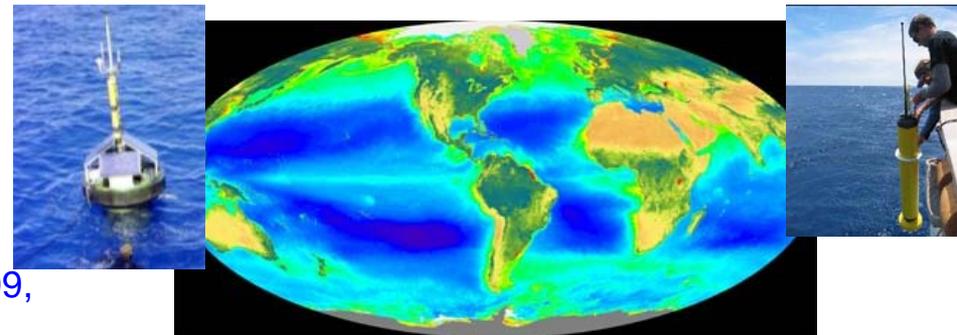




Ocean Colour provides a global view of the marine biosphere and chemosphere (chlorophyll, functional groups, carbon cycle sources and sinks), and contributes to many Societal Benefit Areas (SBAs): Agriculture, Ecosystems, Climate, Water...



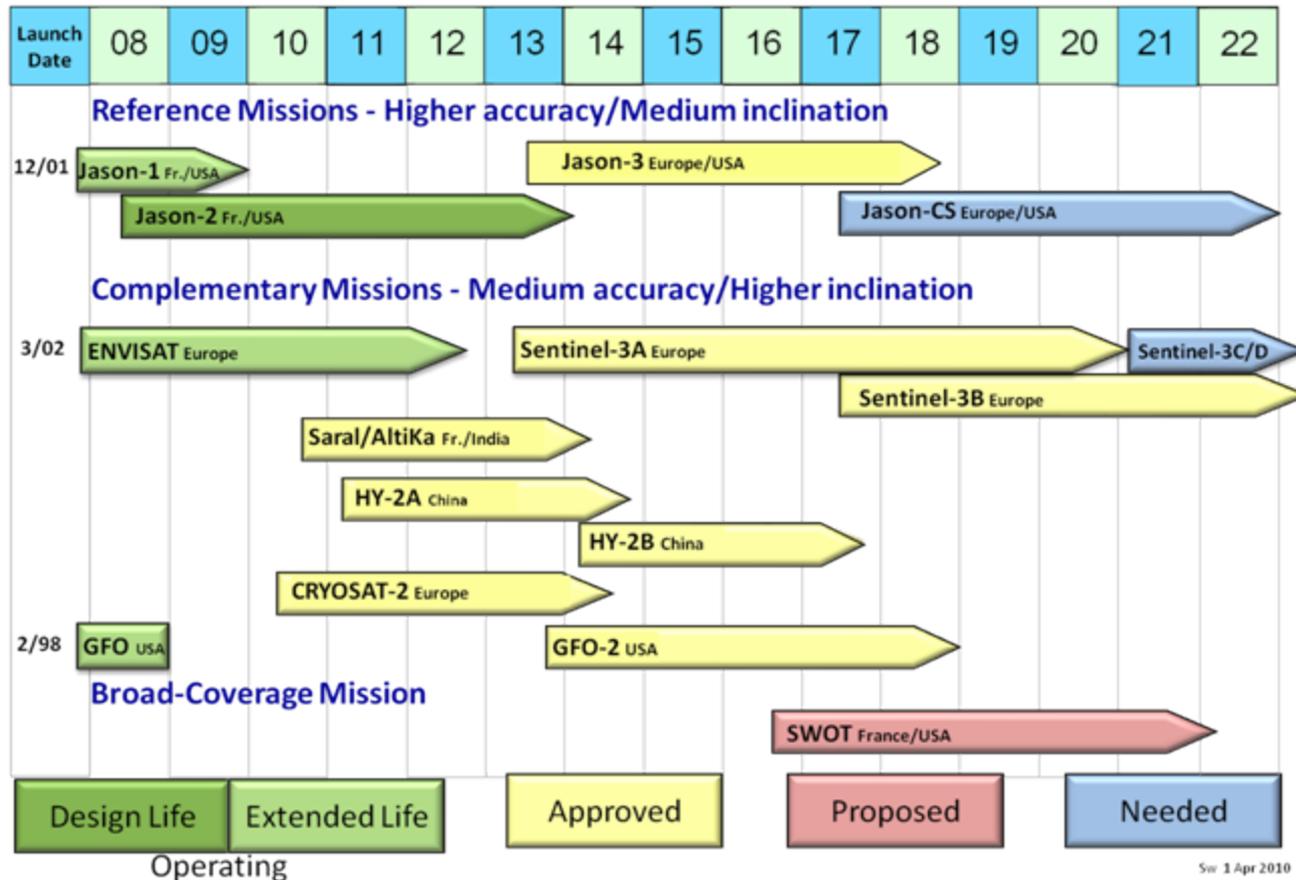
- OCR continuity
 - VIIRS, OLCI, SGLI, OCM-2, GOCI..
- Data quality
 - NASA & ESA OCR-data reprocessing ongoing
- Data Harmonization – supporting ECVs
 - multiple sensor comparison involving MERIS, SeaWiFS, MODIS-Aqua, and OCM-2
- User interface
 - IOCCG Report 8 (2009) “Remote Sensing in Fisheries and Aquaculture” has been published with contribution of SAFARI (AG-06-02)
- Training courses
 - “Inversion procedures in ocean colour remote sensing” in Hamburg 10-14 Aug. 2009
 - “Methods and Applications of Ocean Colour Remote Sensing in African Coastal and Regional Seas” in Zanzibar, Tanzania 10-14 Oct. 2009
 - **Ocean Colour 2009 Africa**, 12 - 23 October 2009, Zanzibar, Tanzania



Global Biosphere (Sep 1997 - Aug 2000) - average Chlorophyll concentration from SeaWiFS



1. Implement a sustained, systematic capability to observe the surface topography of global oceans from the basin scale to the mesoscale (~ 100 km). The surface topography from satellite altimeters and the upper-ocean density field from Argo profiling floats are oceanic analogues to the surface pressure from barometers and the density field from atmospheric profilers.
2. Observations of these two fundamental state variables are necessary for understanding the dynamics of the oceans, assessing their role in climate, and developing an operational forecast capability.



146,000,000 worldwide live within 1 meter of MHW

Guerin, Thorp & Thompson (2007) www.architecture2030.org



Hollywood, FL – Population Impacted 140,000



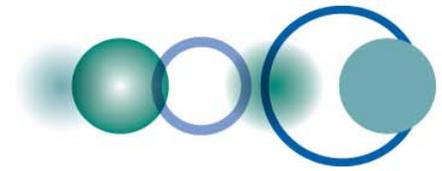
Miami Beach – Population Impacted 88,000

Potential impact of sea

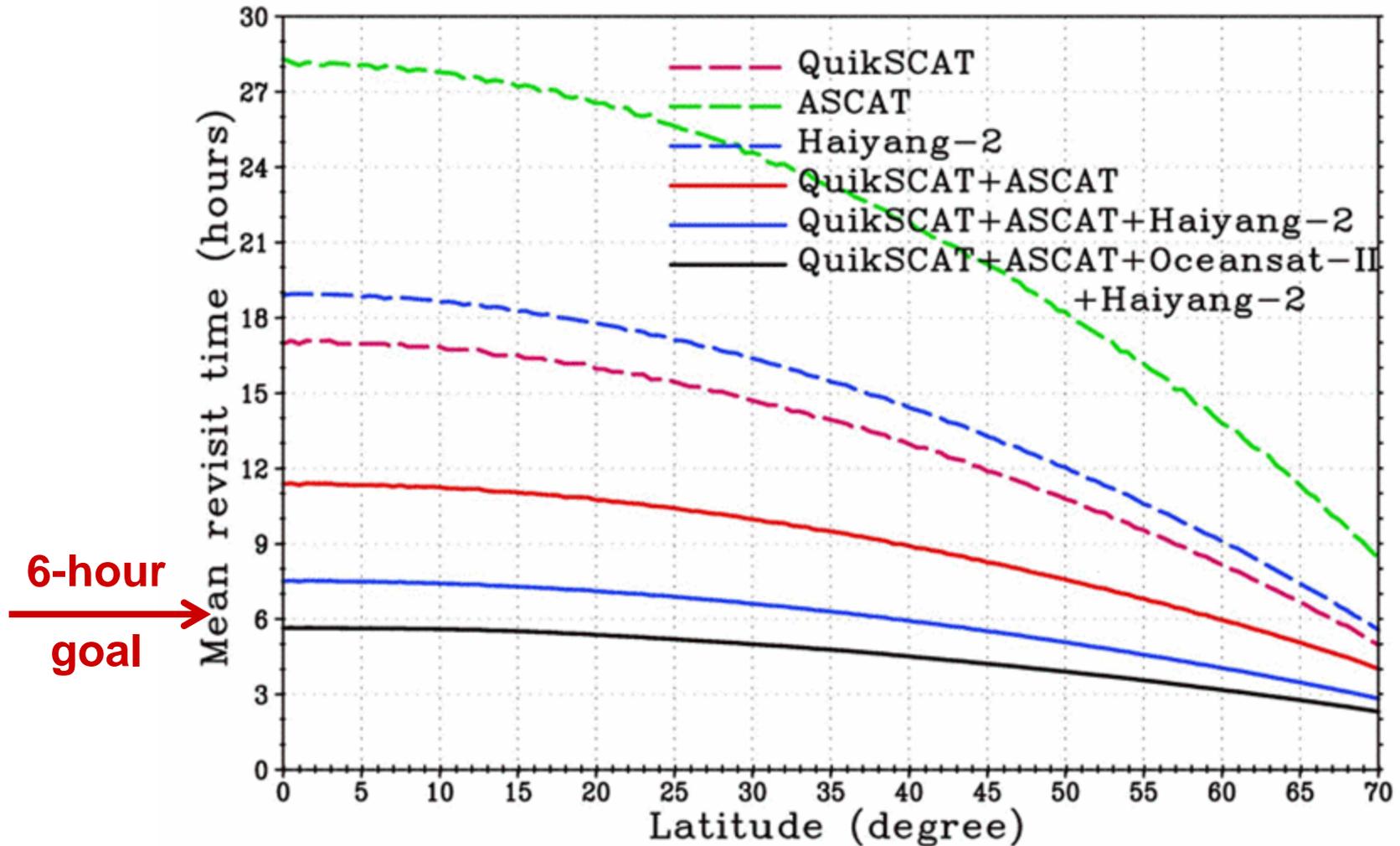


1.5 m - Impact
Total population affected: 17 Million (15%)
Total land area affected: 22,000 km² (16%)

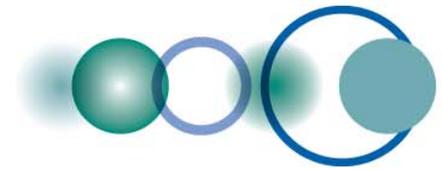




Timely sharing of data enables a significant reduction in revisit time

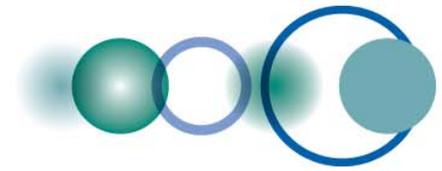


VC Support GCOS/ECV (CL-09-02b)



Observations being collected by current Constellations are underlined
Observations that could be collected by new Constellations are in red font : OceanObs09
proposed new constellations (SST, Sea Ice, GPS Occultation)

Domain	GCOS Essential Climate Variables
Atmospheric (over land, sea and ice)	<p>Surface: Air temperature, <u>Precipitation</u>, Air pressure, Surface radiation budget, <u>Wind speed and direction [over the oceans]</u>, Water vapour.</p> <p>Upper-air: Earth radiation budget (including solar irradiance), Upper-air temperature (including MSU radiances), Wind speed and direction, Water vapour, Cloud properties.</p> <p><u>Composition</u>: Carbon dioxide, Methane, Ozone, Other long-lived greenhouse gases, Aerosol properties.</p>
Oceanic	<p>Surface: Sea-surface temperature, Sea-surface salinity, <u>Sea level</u>, Sea state, Sea ice, Current, <u>Ocean colour (for biological activity)</u>, Carbon dioxide partial pressure.</p> <p>Sub-surface: Temperature, Salinity, Current, Nutrients, Carbon, Ocean tracers, Phytoplankton.</p>
Terrestrial	<p>[Water]: River discharge, Water use, Ground water, Lake levels, Snow cover, Glaciers and ice caps</p> <p>[Radiative]: Permafrost and seasonally-frozen ground, Albedo, <u>Land cover (including vegetation type)</u>, Fraction of absorbed photosynthetically active radiation (fAPAR), Leaf area index (LAI), Biomass, Fire disturbance, Soil moisture.</p>



Generic Constellation Activities

All six Constellations are engaged in various stages of activities:

- Collaboration in cal/val and algorithm development
- Agreement for timely exchange of data and products
- Standardization of products and formats
- Generation of integrated, multi-mission products and distribution from a central site
- Training & capacity building for both researchers and operational users
- Definition of requirements for future systems
- Harmonization of orbits to optimize observational coverage

Cross-cutting support to several GEO Tasks



ZAKUMI
OFFICIAL MASCOT

Thank you

Questions ?

