

Report on Side Meeting on GCOS-related CEOS Climate Actions/UNFCCC

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Side Meeting Discussion

- Structure of the UNFCCC report
- Statement to UNFCCC by CEOS Chair
- Individual country paragraph
- Overall progress and next steps

UNFCCC Report

- The CEOS detailed response to the GCOS IP, which resulted in the 59 actions, was presented at the 2006 meeting.
- UNFCCC SBSTA invited CEOS to provide an updated progress report at its 29th session in December 2008.
- At SIT-21 we agreed the report would be compiled from the individual quarterly progress reports for those actions we initiated.
- Report is due end of September.
- Final review by CEOS completed last week, all inputs were consolidated.

Structure of the CEOS UNFCCC Report

- Purpose
- Background
 - CEOS
 - GCOS IP and ECVs
- Importance of the Satellite Component of GCOS for Climate
- Development of the CEOS Climate Action Plan
- Status of High Priority Actions for Each Domain
- Cross-Cutting Actions
- Summary of Key Accomplishments and Future Plans
- Appendix 1: Overview of CEOS
- Appendix 2: CEOS Actions (separated Priority 1, 2 and 3)

Next Steps

- Initiate formal reporting on at least ten additional priority 2 actions.
- Questionnaire was sent to each CEOS agency POC, Working Group and Constellation Lead to provide a status and potential contribution for remaining climate actions by 10 October, 2008.
- Hold 1-on-1 meetings with each working group and constellation lead.
- Emphasize the generation of long-term climate data records



CEOS Implementation Plan for Space-based Observations for Climate.

Action A-10: CEOS agencies will participate in planning, by 2011, the operational follow-on to the chemistry missions planned for the next 5 to 7 years.

Priority	3
Current Status	
Future plans	
Expected key deliverables	

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Assuming that operational chemistry missions will be provided by one of the ‘big’ space agencies with DLR participating in the area of data processing, archiving and dissemination we can provide inputs w.r.t. algorithm & processor development and data management. Candidate missions are (note: the term ‘operational’ may be defined differently in these missions)

- atmospheric chemistry payloads on ENVISAT in the extended mission until 2013/2014
- ESA Sentinel 4 and 5
- Metop follow on to Metop-A

Next Steps

- GCOS reprocessing priorities:
 - Atmosphere
 - Wind, Precipitation, Clouds, Aerosols
 - Ocean
 - SST, Sea Ice, Sea Level, Ocean Color
 - Land
 - Land cover change, glaciers
- Present CEOS status on climate actions to GCOS Steering Committee on October 15
- At CEOS Plenary – discuss the new set of initiated actions

Reporting of Actions

- GCOS recognize CEOS response to GCOS IP is comprehensive but not complete (e.g. no atmospheric CDRs with exception of reprocessed geostationary winds)
- CEOS climate coordinator will also report to GCOS on the progress of relevant CEOS-GEO climate actions complementing the original 59 actions.



SIT-22

September 17-18, 2008
Tokyo International Exchange Center
Tokyo, Japan



Backup

CEOS 59 Actions

1. Ensuring continuity of climate-relevant satellite measurements (13 actions);
2. Taking a systematic approach to generating fundamental climate data records (FCDRs) (11actions);
3. Preserving climate data records (4 actions);
4. Ensuring access to climate data products (10 actions);
5. Coordinating international communities and interaction with users (10 actions); and
6. Addressing future measurement needs (11 actions).

CEOS Key Categories in support of GCOS IP

1. Ensuring continuity of climate-relevant satellite measurements
2. Taking a systematic approach to generating fundamental climate data records (FCDRs)
3. Preserving climate data records
4. Ensuring access to climate data products
5. Coordinating international communities and interaction with users
6. Addressing future measurement needs

CEOS Climate Actions

- A first round of climate actions assessment, in coordination with GCOS, led to the identification of:
 - 22 “Priority 1 actions”
 - Deemed to be progressed immediately
 - Capable of delivering significant outcomes within a 1-2 year timescale.
 - 32 “Priority 2 actions”
 - Continuous, on-going, or require additional information from potential contributors in order to be suitably defined
 - will not necessarily deliver significant results in the 1-2 year timescale.
 - 5 “Priority 3 actions”
 - Considered premature at this stage.

Table 2. Subjects of High Priority Actions for Each Climate Domain


Atmospheric Domain	Subject
A-3	Cloud properties and trends
A-4	Improved precipitation measurements: The Precipitation Constellation
A-5	Absolute, spectrally resolved radiance measurements
A-6	Earth Radiation Budget Sensor
A-7	Total Solar Irradiance Sensor
A-8	Ozone Mapping and Profiler Sensor limb instrument
A-9	Aerosol <u>Polarimetry</u> Sensor
Oceanic Domain	
O-1	Microwave and <u>Vis/IR</u> (Infrared) observations of sea ice
O-2	Generation of sea ice data records
O-4 and O-5	Future Ocean Surface Topography Constellation for sea level and altimeter to fill potential gap in sea level measurements
O-6	Missions to maintain continuity and improve sea surface temperature record
Terrestrial Domain	
T-1	Basis for future Land-surface Imaging Constellation
T-4	Improving quality of <u>FCDRs</u> and <u>ECVs</u> from the Advanced Very High Resolution Radiometer (AVHRR) record


SIT-22


Tokyo, Japan

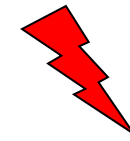
Active Actions


Potential new active actions

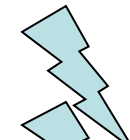
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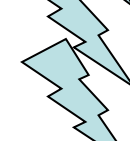
Action A-1: In 2007 CEOS agencies will review the capability of passive microwave sensors to make scatterometer-quality measurements and will work to ensure A.M. and P.M. satellite coverage of surface wind speed and direction by 2015.
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Action A-2: CEOS will strive to ensure continuity of GPS RO measurements with, at a minimum, the spatial and temporal coverage established by COSMIC by 2011. CEOS will continue efforts in 2007 to exploit the complementary aspects of radiometric and geometric upper-air determinations of temperature and moisture.
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Action A-3: CEOS will support in 2007 investigations of cloud properties and cloud trends from combined satellite imager plus sounder measurements of clouds (with horizontal as well as vertical information) using Cloudsat/CALIPSO for validation.
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Action A-4: CEOS agencies will ensure continued improvements to precipitation determinations demonstrated by TRMM and planned by GPM in 2010. The Japan Aerospace Exploration Agency (JAXA) and the National Aeronautics and Space Administration (NASA) will lead a CEOS study team to establish, by 2007, the basis for a future Global Precipitation Constellation.
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Action A-5: CEOS will plan by 2011 to make absolute, spectrally resolved measurements of radiance emitted and reflected by the Earth to space for information on variations in both climate forcings and responses.
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Action A-6: CEOS agencies will participate in re-planning, by 2007, the Earth Radiation Budget Sensor (ERBS) removed from the planned payload of NPOESS.
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Action A-7: CEOS agencies will participate in re-planning, by 2007, the Total Solar Irradiance Sensor (TSIS) removed from the planned payload of NPOESS.
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Action A-8: CEOS agencies will participate in re-planning, by 2007, the OMPS limb instrument removed from the planned payload of NPOESS.

Atmospheric Domain



Action A-9: CEOS agencies will participate in re-planning, by 2007, the APS instrument removed from the planned payload of NPOESS.




Action A-10: CEOS agencies will participate in planning, by 2011, the operational follow-on to the chemistry missions planned for the next 5 to 7 years.




Action A-11: CEOS agencies will commit in 2007 to reprocessing the geostationary satellite data for use in reanalyses projects before the end of the decade.

Action A-12: CEOS will determine options by 2010 for continuing improvements to wind determinations demonstrated by MODIS and to be demonstrated by ADM Aeolus.

Ocean Domain




Action O-1: CEOS agencies will examine their respective plans to maintain provision of microwave brightness temperatures and visible/infrared radiances for the sea ice ECV.




Action O-2: Relevant CEOS space agencies will consult with the science community on appropriate retrieval algorithms of passive microwave observation for reprocessing sea-ice products. Norway has expressed interest in committing to operational production of a global sea ice ECV (an initiative by the Norwegian Meteorological Institute, and coordinated by the Norwegian Space Center). The European Space Agency (ESA) is currently reprocessing the relevant ERS and Envisat archive to complement Canada's Radarsat in the context of WCRP's Climate and the Cryosphere (CLiC) core project.


Action O-3: New space-based measurements and products, including ice thickness and ice drift, will be considered by CEOS agencies as part of their future research missions.



Action O-4: The National Oceanic and Atmospheric Administration (NOAA) and EUMETSAT will lead a CEOS study team to establish, by 2007, the basis for a future Ocean Surface Topography Constellation that satisfies the threshold requirements for the sea level ECV (and those of the sea state ECV). This will include consideration of a future Jason-3 mission and requirements for new altimeter technologies to improve spatial resolution and extend observations in coastal regions (and over lakes and rivers for the lakes ECV).



Action O-5: The Centre National d'Etudes Spatiales (CNES) and the Indian Space Research Organization (ISRO) will cooperate on a new polar-orbiting altimeter aimed at filling a potential data gap beyond 2008. ESA and the European Union (EU) will lead planning for Sentinel-3 carrying an altimeter to complement spatial/temporal coverage of the sea level (and sea state) ECVs (and possibly sea ice extent and thickness, river, and lake level with the altimeter operating in Synthetic Aperture Radar (SAR) mode beyond 2012).



Action O-6: An ATSR-like instrument is planned on ESA's Sentinel 3, presently scheduled for launch in 2012. JAXA will lead planning for Global Change Observation Mission-Water (GCOM-W) and GCOM-C (Climate) to maintain continuity of the sea surface temperature ECV.

Ocean Domain



Action O-7: CEOS agencies will examine their respective plans to maintain provision of microwave brightness temperatures for the sea surface temperature ECV.



Action O-8: Relevant CEOS agencies will examine their respective plans to maintain continuity of a 10-km-resolution sea surface temperature data sets global product.



Action O-9: CEOS agencies will cooperate to support the combination of all existing sea surface temperature data sets into a global FCDR.



Action O-10: ISRO will lead planning of Oceansat-2, ESA and the EU of Sentinel-3, and JAXA of GCOM-C, which are all new missions planned to carry an ocean colour sensor.



Action O-11: Relevant CEOS agencies will examine their respective plans to maintain continuity of the 25-km-resolution ocean colour global product.



Action O-12: CEOS agencies will cooperate to support the combination of all existing ocean colour data sets into a global FCDR.

Action O-13: In consultation with GCOS and the relevant user communities, CEOS agencies will explore the means to secure, by 2011, continuity of the 1-km-resolution global ocean colour product needed to fulfil the target GCOS requirements.

Action O-14: CEOS agencies will cooperate with the user community to support efforts aimed at building on the decade-long satellite sea state records and making a comprehensive use of future altimeter- and SAR-bearing missions.




Action O-15: ESA will fly SMOS in 2007 to demonstrate measurement of the sea surface salinity (and soil moisture) ECV; NASA/CONAE will fly Aquarius/SAC-D in 2009 to demonstrate measurement of the sea surface salinity ECV.

Action O-16: CEOS agencies will cooperate in developing future plans for an Ocean Salinity Constellation.

Ocean Domain


- ★ **Action O-17:** CEOS agencies will undertake planning for reprocessing past data to improve FCDRs and legacy databases (e.g., AVHRR Pathfinder, ATSR, Sea Level Pathfinder, and the sea ice ECV) in close coordination and partnership with existing advisory groups and reanalysis centres. All Level 2 data products for use in reanalysis should be properly accompanied by estimates of their uncertainty.
- ★ **Action O-18:** CEOS, through its Working Group on Calibration and Validation (WGCV) and in the context of developing standards for on-going missions and for the Constellations, will recommend best practices for pre-launch and onboard calibration of ocean sensors and for validation of space-based ocean observations with in situ sensors, including the establishment and maintenance of calibration and validation sites and networks. This will facilitate the combination of data from different sources and enable the establishment of global data sets and long-term series.
- ★ **Action O-19:** CEOS agencies, in cooperation with other partners, will support planning for a follow-on to GODAE by 2007.

Terrestrial Domain

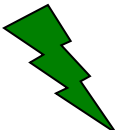


Action T-1: CEOS agencies will determine which alternative approach best fills the current Landsat-class data gap and will explore the potential of integrating high-resolution data from multiple platforms (e.g., China-Brazil Earth Resources Satellite (CBERS), Indian Remote Sensing (IRS) satellite, Landsat, Satellite Pour l'Observation de la Terre (SPOT), and others) based on the results of a CEOS study team led by the United States Geological Survey (USGS) that will establish, by 2007, the basis for a future Land-Surface Imaging Constellation.

Action T-2: CEOS agencies will assess the feasibility of generating global historic and continuing ECVs at fine resolutions for land cover and glacier change.




Action T-3: CEOS (led by USGS and NOAA), in cooperation with relevant stakeholders, will explore the feasibility, by 2007, of retrieving and reprocessing the 1-km AVHRR data record from various centralized archives (NOAA and High Resolution Picture Transmission (HRPT) stations).



Action T-4: CEOS will work to enhance the quality of the FCDRs and the ECVs generated from the AVHRR record to meet threshold requirements.

Action T-5: CEOS agencies will undertake research to support satellite technology development, such as lidar or P-band sensors, that are capable of retrieving biomass and LAI globally that meet GCOS requirements. CEOS agencies will also support research to improve algorithms that do not currently meet GCOS threshold requirements. New satellite technology and algorithms should be available by 2015.



Action T-6: CEOS will assess the feasibility of collecting operational multi-angle observations. Research will be carried out by CEOS agencies to improve radiation transfer schemes for albedo and fAPAR, especially under cloudy conditions.

Cross Cutting



Action C-1: CEOS will review the prevailing institutional arrangements in place for the planning and implementation of cooperative efforts by space agencies in the domain of climate (among others) by 2007. In particular CEOS agencies will review the ways to improve coordination of future remote sensing tasks that address the upcoming space-based measurement challenges, so as to avoid duplication of efforts while taking cooperation between the international partners to a higher level.



Action C-2: CEOS agencies will work with GEO to leverage progress and results from the implementation actions for climate to benefit all other relevant SBAs.



Action C-3: CEOS will work with GCOS to periodically evaluate climate needs and their realization.

Action C-4: CEOS agencies will adjust their internal procedures and mechanisms relative to satellite mission planning and operating processes in order to ensure adequate adherence to the GCMPs.



Action C-5: CEOS agencies will review their respective satellite data records with particular attention to adherence to the GCMPs and will consider undertaking necessary corrective actions within available resources.



Action C-6: CEOS will consider the GCMPs and relevant ECV requirements in defining criteria that will serve as the foundation for the CEOS Constellation studies being initiated in 2006 and beyond.



Action C-7: CEOS agencies will increase their cooperation in ensuring stability, accuracy, and inter-comparability of their respective satellite observations. These observations will be tied to irrefutable international standards in order to enhance the utility of space programmes for climate applications.



Action C-8: CEOS agencies will contribute to development of GSICS under development by CGMS and WMO to better integrate calibration efforts. Furthermore, CEOS agencies will continuously pursue establishment of reference measurements in space, complementing those on the ground and in the air, which will enable absolute inter-calibration of radiance measurements.



Action C-9: CEOS will charge its WGCV to promote existing in situ networks, identify new opportunities for product validation, and support both validation research and operational validation projects at an adequate level.

Cross Cutting



Action C-10: CEOS agencies will coordinate their efforts in designing future data archives and data dissemination systems, ensuring that past data holdings (including associated metadata) are preserved, assessing standards and protocols, and incorporating new information technology (IT) developments as much as possible. Practical actions in response to this cross-cutting need will be developed by CEOS' Working Group on Information Systems and Services (WGISS) in line with the technical solutions adopted by GEO.



Action C-11: CEOS agencies will systematically consult with appropriate scientific and user advisory groups in establishing detailed specifications for each FCDR and derived products, including associated uncertainties.



Action C-12: CEOS agencies will consult on appropriate rules to ensure sustained, open accessibility to FCDRs in order to allow the periodic reprocessing and generation of homogeneous products.



Action C-13: CEOS agencies will generate, within available resources, independently processed data sets and products.



Action C-14: Recognising that space agencies are responsible for only a portion of the value chain involved in the generation of FCDRs, CEOS will explore ways to strengthen linkages to the communities involved in climate product generation and use, e.g., through framework agreements with major reanalysis centres.





Action C-15: CEOS agencies will encourage funding of climate change research at an adequate level for multiple groups to analyze data records, reprocess climate variables, and perform reanalysis.







Action C-16: CEOS agencies will consider, in the context of the Constellations, ways and means to support the transfer of demonstrated observations from research satellites into operational capabilities. In particular, CEOS will encourage "convergence" of climate-observing requirements (usually for high-quality data) with operational requirements (usually for rapid and ensured data availability), and support institutional arrangements that would help transfer ECVs from research to operations



Cross Cutting



 **Action C-17:** CEOS agencies will maintain R&D efforts aimed at confronting the knowledge challenge posed by climate and climate change, and strive to overcome the current scientific and technical limitations of climate-quality measurements.

 **Action C-18:** CEOS agencies will ensure that data acquired through research satellites are fully used for the benefit of creating and/or improving the FCDRs of all ECVs.

 **Action C-19:** CEOS agencies will continue to devote particular efforts to the reprocessing and improvement of these fundamental data sets.

   **Action C-20:** CEOS agencies will endeavour to ensure global, easy, and timely access to climate-related products, including by developing countries.

  **Action C-21:** CEOS will establish a programme in 2007 to document the data archive and access arrangements in place for each of the FCDRs contributed by space agencies. WGISS will lead this effort in order to evaluate practical solutions to current obstacles and issues.

  **Action C-22:** CEOS agencies will continue their efforts, both individually and through the CEOS Working Group on Education and Training (WGEdu), to build capacity.