

GLOBAL CLIMATE OBSERVING SYSTEM

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GCOS Report to the CEOS WG Climate

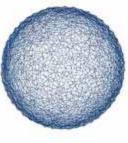
- 2011 update to the satellite supplement

26-27 May 2011, Frascati, ESRIN/ESA, Italy

2010 Update to the GCOS Implementation Plan in support of the United Nations Framework Convention on Climate Change (UNFCCC)

- A decision on systematic climate observations (Decision 9/CP.15) adopted by the 15th session of the Conference of the Parties held in Copenhagen in December 2009, contains provisions to further enhance climate observations, including through observations from space, coordinated through the Committee on Earth Observation Satellites (CEOS), and activities to be undertaken by the Global Climate Observing System (GCOS) and the Global Terrestrial Observing System (GTOS).
- Submission of the of the updated GCOS Implementation Plan COP16, Cancun, Dec 2010







Draft decision -/CP.15 tematic climate observatio

The Conference of the Parties.

Benefity Article 4, perspecify 1(p-4), and Article 5 of the Convention, Parties receive decision 1 CP 3, 14 CP 4, 5 CP 5, 10 CP 8, 5 CP 10 and 10 CP 31

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2010 Update to the GCOS Implementation Plan

Basis:

- 2004 GCOS IP (GCOS-92); 2006 Satellite Supplement (GCOS-107)
- Update, not rewrite

Recognizing changes since 2004 in:

- Science
- Measurement Technology
- Needs
- International coordination (e.g., GEO/GEOSS, UN "Delivering as One", Space agency response to climate)
- Responding to Plan in 2010-2015 would contribute to:
 - Global observations addressing Essential Climate Variables
 - Associated analysis, research, infrastructure and capacity building

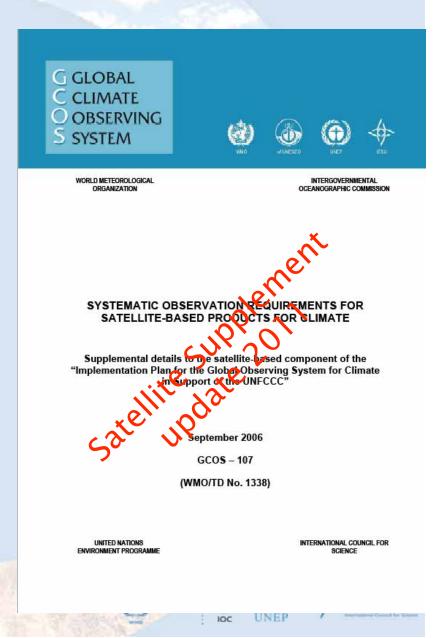


GCOS - 2011 Update to the Satellite Supplement

Update to the 2006 Satellite Supplement to the GCOS IP (GCOS-107)

- Update detailed GCOS requirements for FCDRs and ECV products in terms of
 - accuracy,
 - stability,
 - temporal/spatial resolution,
 - calibration and validation needs and opportunities,
 - relevant international working groups.

for Atmosphere, Ocean, Land and Cross-Cutting actions.



GCOS - 2011 Update to the Satellite Supplement

 Expert Meeting, January 10–12, 2011, Geneva

Outcome:

- improvements on most of the ECVs
- extra sections, e.g., on GHGs, precursors,

for example « pressure » emerges now also as space- based observed ECV.

Open for public review, 9 May – 1 July 2011 on http://gcos.wmo.int

Finalising draft, September 2011.

 Submission to 35th SBSTA session at COP17, Durban 2011, as INFORMATION Document.

SYSTEMATIC OBSERVATION REQUIREMENTS FOR SATELLITE-BASED PRODUCTS FOR CLIMATE

2011 Update

Supplemental details to the satellite-based component of the "Implementation Plan for the Global Observing System for Climate in Support of the UNFCCC (2010 Update)"

DRAFT version 1.1

(28 APRIL 2011)



Space based ECVs

Table 1: ECVs significantly dependent upon satellite observations³

Domain	Essential Climate Variables	
Atmospheric (over land, sea and ice)	Surface wind speed and direction, Precipitation, Upper-air temperature, Upper-air wind speed and direction, Water vapour, Cloud properties, Earth radiation budget (including solar irradiance), Carbon dioxide, Methane, and other long-lived greenhouse gases, Ozone and Aerosol properties, supported by their precursors.	
Oceanic	Sea-surface temperature, Sea-surface salinity, Sea level, Sea state, Sea ice, Ocean colour.	
Terrestrial	errestrial Lakes, Snow cover, Glaciers and ice caps, Ice sheets, Albedo, Land cover (includ vegetation type), Fraction of absorbed photosynthetically active radiation (FAPAR), Leaf at index (LAI), Above-ground biomass, Fire disturbance, Soil moisture.	



Atmosphere 1 for products Requirements

Fundamental Climate Data Product Records required for Product Numbers (IP-10 Global Products requiring Satellite ECV Generation Reference Observations (from past, current and future Actions) missions) Surface Wind Passive microwave radiances and A.1 Speed and Surface wind retrievals (A11) scatterometry Direction Estimates of liquid and solid precipitation, derived from specific Passive microwave radiances: A.2 Precipitation instruments and provided by Geostationary VIS/NIR/IR radiances (A6, A8, A9, A10) composite products Upper-air temperature retrievals; Passive microwave and IR radiances: A.3.1 Upper-air Temperature of deep atmospheric GNSS radio occultation bending A.3.2 Temperature (A20, A21) layers angles Upper-air VIS/IR imager radiances; A.4 Wind Speed Upper-air wind retrievals (A11) Doppler wind lidar and Direction A.5.1 Passive microwave radiances: Total column water vapour: A.5.2 Tropospheric and lower-stratospheric UV/VIS imager radiances: A.5.3 Water Vapour profiles of water vapour: IR and microwave soundings: (A7, A21, A22, Upper tropospheric humidity Limb soundings A26) Cloud amount, too pressure and temperature, optical depth, water path VIS/IR imager radiances: IR and microwave soundings Cloud Properties A.6.1 A.6.2 A.6.3 A.6.4 A.6.5 A.6.6 and effective particle radius (A23, A24) Earth radiation budget (top-of-Broadband radiances; Earth A.7.1 Spectrally-resolved solar irradiances; atmosphere and surface); Radiation A.7.2 Total and spectrally-resolved solar Geostationary multispectral imager (A14, A25) Budget irradiance radiances Carbon Retrievals of greenhouse gases, such Dioxide A.8.1 as CO₂ and CH₄, of sufficient quality to NIR/IR radiances Methane and (A26, A28, A29) estimate regional sources and sinks other GHGs A.9.1 Total column ozone: UV/VIS and IR/microwave radiances. A 9 2 Tropospheric ozone: Ozone A 9.3 from nadir and limb sounding Ozone profiles (A26, A32) A.10.1 Aerosol optical depth: Aerosol A.10.2 Aerosol single scattering albedo; UV/VIS/NIR/SWIR and TIR radiances Properties A.10.3 Aerosol layer height (A33) Precursors supporting Retrievals of precursors for aerosols A.11.1 the Ozone and ozone such as NO2, SO2, HCHO UV/VIS/NIR/SWIR and TIR radiances (A26, A27, A34) and Aerosol and CO ECVs

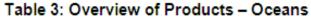
Table 2: Overview of Products – Atmosphere



)cean ъ Requirements for products

Fundamental Climate Data Product Records required for Product Global Products requiring Satellite Numbers (IP-10 ECV Generation Observations Reference (from past, current and future Actions) missions) Integrated sea-surface temperature Sea Surface Single and multi-view IR and 0.1 analyses based on satellite and in situ (04, 07, 08) Temperature microwave imager radiances data records Sea Surface Datasets for research on identification 0.2 Microwave radiances Salinity of changes in sea-surface salinity (012) 0.3 Sea level global mean and regional Sea Level Altimetry variability (010) Wave height, supported by other 0.4 Sea State measures of sea state (wave direction, Altimetry (016) wavelength, time period) Sea-ice concentration/extent/edge. Microwave and visible imager 0.5 Sea Ice supported by sea-ice thickness and radiances (018, 019, 020) sea-ice drift Supported by SAR altimetry Ocean colour radiometry - water 0.6.1, 0.6.2 Multispectral VIS imager radiances Ocean Colour leaving radiance; (015, 023) Oceanic chlorophyll-a concentration, derived from ocean colour radiometry

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ECV or supporting variable	Global Products requiring Satellite Observations	Fundamental Climate Data Records required for Product Generation (from past, current and future missions)	Product Numbers (IP-10 Reference Actions)
Lakes	For lakes in the Global Terrestrial Network for Lakes: Areas of lakes; Lake levels	VIS/NIR imager radiances, and radar imager radiances; Altimetry	T.1.1, T.1.2 (T8)
Snow Cover	Snow areal extent; Supplemented by: Snow water equivalent	Moderate-resolution VIS/NIR/IR and passive microwave imager radiances	T.2 (T16)
Glaciers and Ice Caps	Glacier 2D outlines (delineating glacier area); Supplemented by digital elevation maps of glaciers and ice caps	High-resolution VIS/NIR/SWIR optical imager radiances; Supplemented by: Radar, SAR, along- track stereo imaging	T.3 (T17)
Ice Sheets	Ice-sheet elevation changes; Supplemented by: Fields of ice velocity and ice mass change	Radar and laser altimetry; Supplemented by: SAR, Gravity	T.4 (T20)
Albedo	Broadband black sky and spectral white sky albedo	Multispectral and multiangular imager radiances	T.5 (T24, T25, T3)
Land Cover	Moderate-resolution maps of land- cover type; High-resolution maps of land-cover type, for the detection of land-cover change	Moderate-resolution multispectral VIS/NIR imager radiances; High-resolution multispectral VIS/NIR imager radiances Supplemented by: Radar	T.6.1, T.6.2 (T26, T27, T28)
FAPAR	Maps of the Fraction of Absorbed Photosynthetically Active Radiation	VIS/NIR multispectral imager radiances	T.7 (T31, T29, T3)
LAI	Maps of Leaf Area Index	VIS/NIR multispectral imager radiances	T.8 (T31, T30, T29, T3)
Biomass	Regional and global above-ground forest biomass	Long-wavelength radar and lidar	T.9 (T32)
Fire Disturbance	Maps of burnt area, supplemented by active-fire maps and fire-radiated power	VIS/NIR/SWIR/TIR moderate-resolution multispectral imager radiances	T.10 (T35, T36, T37, T38, T39)
Soil Moisture	Research towards global near-surface soil-moisture map (up to 10cm soil depth)	Active and passive microwave	T.11 (T13, T14)
Land-surface temperature	Land-surface temperature records to support generation of land ECVs	High-resolution IR radiances from geostationary and polar orbiting	T.12 (T5, T13, T23,
		satellites; microwave radiances from polar orbiting satellites	T27, T28)

Requirements for products - Land

Recommendations

- 1. Ensure attention to the needs identified in this report related to the planning, initiation and continuity of satellite missions that are needed to provide satellite climate data records;
- 2. Ensure a systematic approach in applying, to the greatest extent possible, the GCOS Climate Monitoring Principles for the generation of satellite climate data records, recognizing in particular the need for overlaps in missions and for *in situ* measurements for calibration and validation purposes;
- 3. Ensure long-term custody of satellite climate data records and their associated metadata, and provide open access to these records;
- 4. Ensure and encourage the generation of, and access to, products based on the satellite climate data records;
- 5. Ensure wide and continuing interaction among the international scientific, operational and end-user communities, to ensure effective feedback mechanisms and continuing advice on observation and product needs;
- 6. Sustain active research satellite programmes that address challenging measurement needs and that allow capabilities to advance and be more cost effective.
- Parties supporting space agencies ensure that the remits of those agencies enable them to incorporate the needs for systematic observation of climate as identified in this report (e.g., appropriate structural arrangements and responsibilities within agencies; planning for the maintenance of satellite climate data records and product generation).

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