

ГЛОБАЛЬНАЯ СИСТЕМА
НАБЛЮДЕНИЙ ЗА КЛИМАТОМ
НЕУСТАННО СЛЕДИМ ЗА КЛИМАТОМ

SYSTÈME MONDIAL
D'OBSERVATION DU CLIMAT
NOUS VEILLONS SUR LE CLIMAT

النظام العالمي
لرصد المناخ
لنضع المناخ نصب أعيننا

全球气候观测系统
密切监视气候

SISTEMA MUNDIAL
DE OBSERVACION DEL CLIMA
SIEMPRE VIGILANDO EL CLIMA

GLOBAL CLIMATE
OBSERVING SYSTEM
KEEPING WATCH OVER OUR CLIMATE

GCOS Implementation Plan: relevance for Space Agencies

A. Bombelli – GCOS Secretariat

19th Meeting of the Joint CEOS-CGMS Working Group on Climate

ESA-ESRIN, 16-17/10/2023



**GLOBAL CLIMATE
OBSERVING SYSTEM**

KEEPING WATCH OVER OUR CLIMATE



Supported by the European Union



GCOS – Global Climate Observing System



GCOS was established in 1992 to address the UNFCCC systematic observation agenda

GCOS is a Co-Sponsored Programme:

- WMO



- IOC - UNESCO



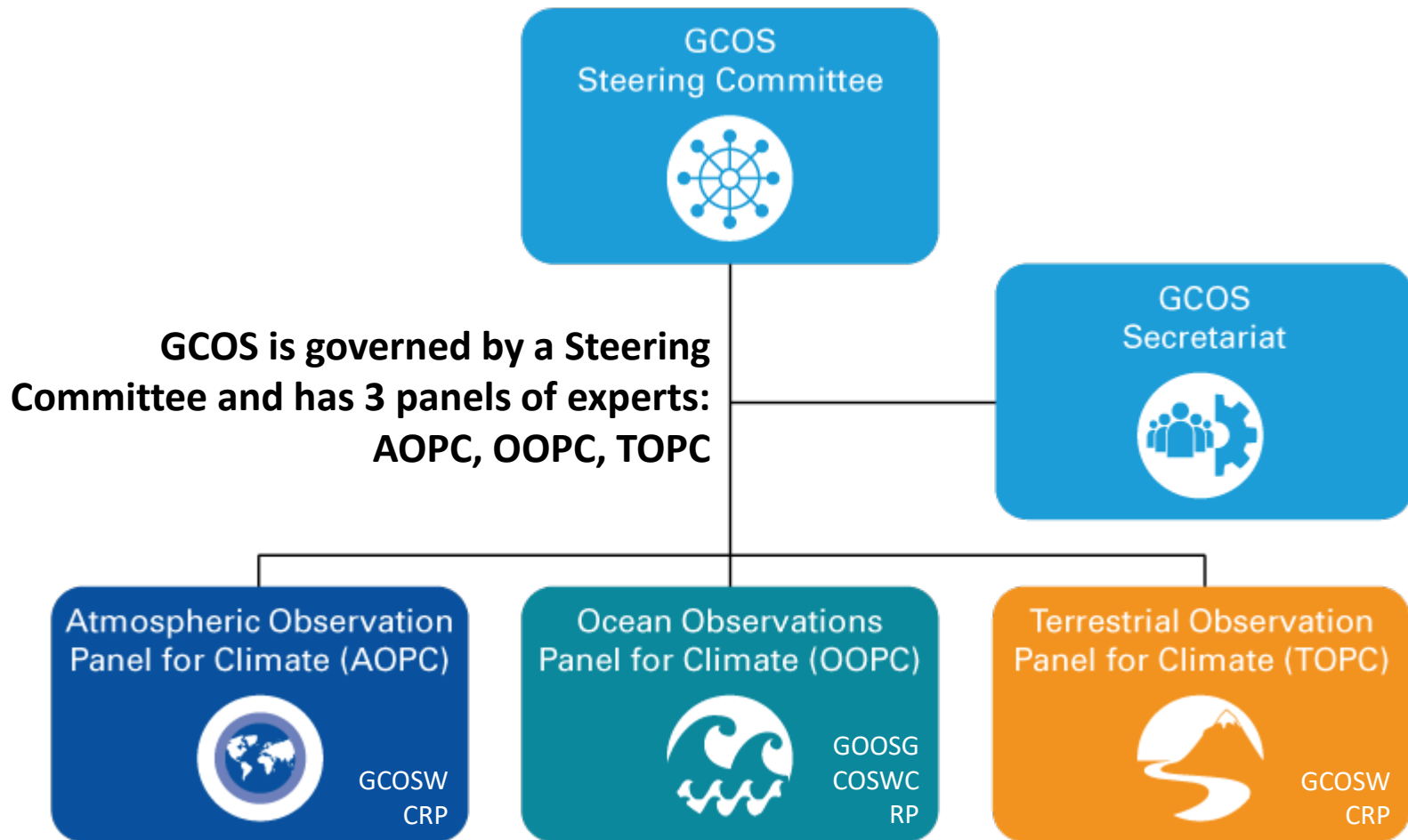
- UNEP



- ISC



Additional contributors:
EU Commission, US State Dept.,
NOAA, Germany, EUMETSAT



GCOS – New Leadership



New Director of the GCOS Secretariat

Mr Nir Stav

Previous Executive Director of the
Israeli Meteorological Service



New Chair of GCOS Steering Committee

Ms Thelma Krug

INPE, National Institute for Space Research of Brazil
Previous vice-chair of IPCC

GCOS – Global Climate Observing System

VISION: a world where users have free access to the climate-related information they need

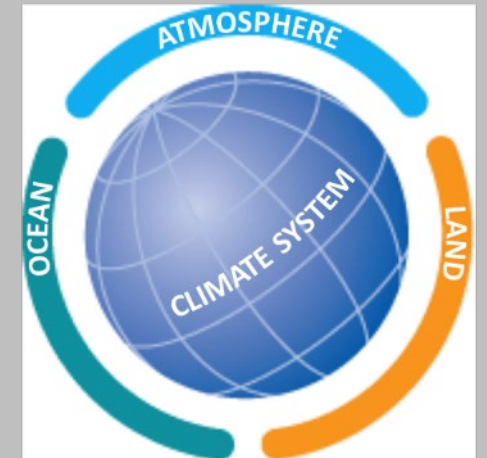
AIM: to ensure the availability and quality of observations necessary for climate data, so that people can cope with climate variability and change

ACTIVITIES

Identify user needs. for climate monitoring - adaptation, sustainable development, the UNFCCC and other MEA

Ensure that climate **observations are enhanced and continued into the future**

Advocate for **free and open access to relevant data**



GCOS: an integrated system

GCOS does not make observations itself, is a system of systems cooperating with a wide range of organizations: National Meteorological and Hydrological Services, Satellite Agencies, in situ networks, National and regional bodies, Research centres, etc.



Other Global Organizations and Networks for specific terrestrial ECV



Satellite observations are coordinated by the Joint CEOS/CGMS Working Group on Climate

Examples of national and regional networks




Meteorological related networks, like: WIGOS, GSN, GUAN, GRUAN, GBON



a number of different ocean climate-related networks, in collaboration with GOOS



Examples of global networks associated with GCOS



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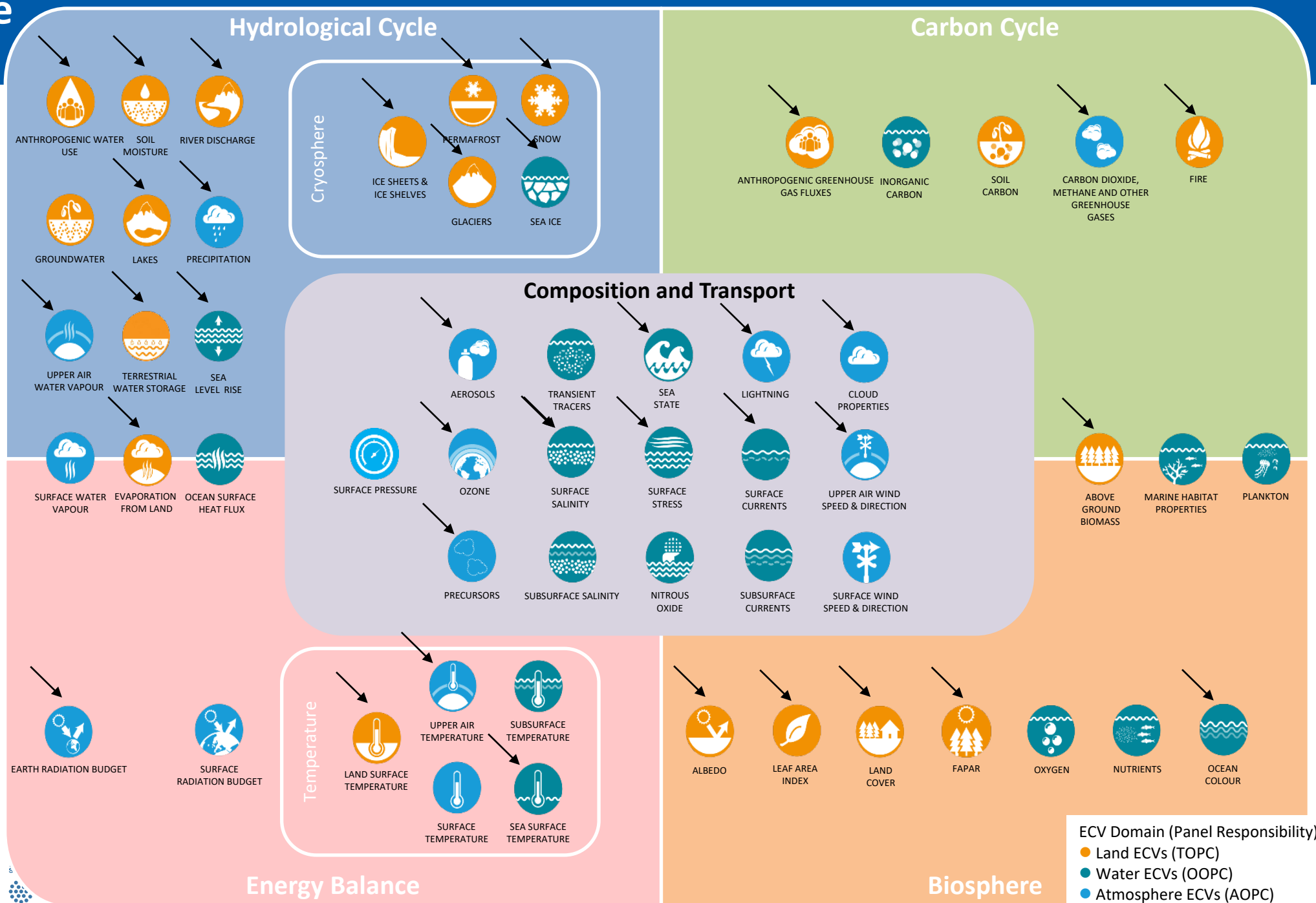
and a wide range of other partners who support GCOS, host data centres, etc

Essential Climate Variables - ECVs

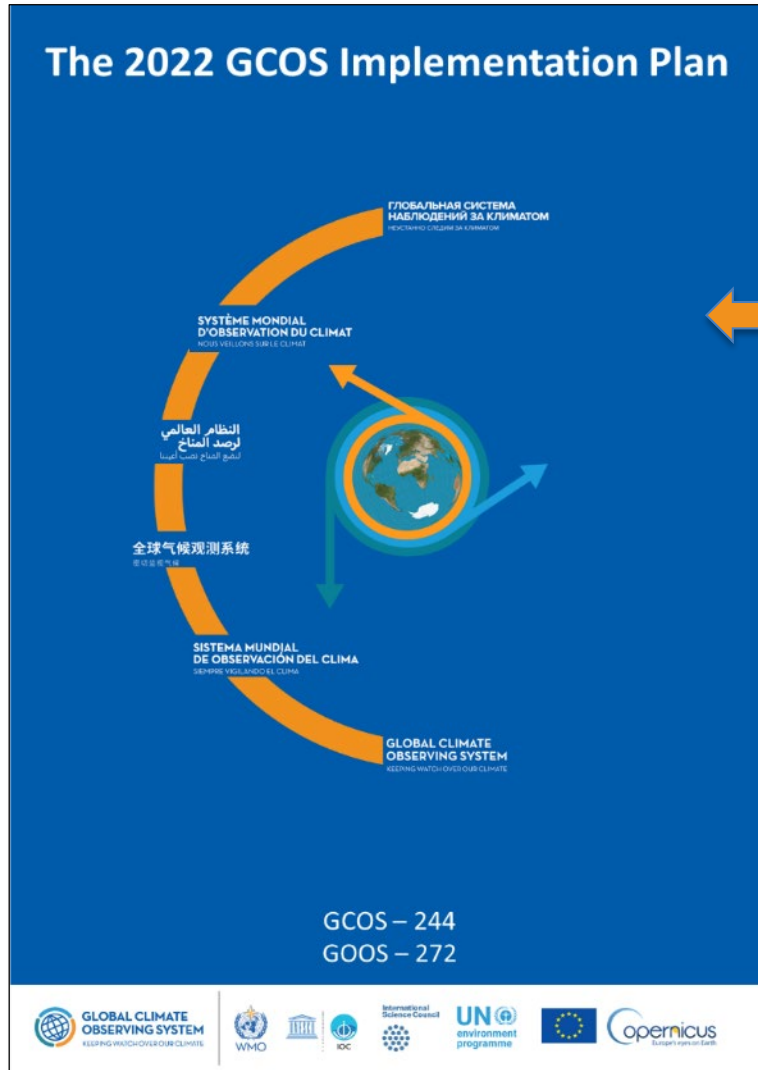
55 ECVs - 37 can be measured from space

ECVs aim to monitor the climate system as a whole, covering the interlinked Earth's energy balance and the carbon and water cycles.

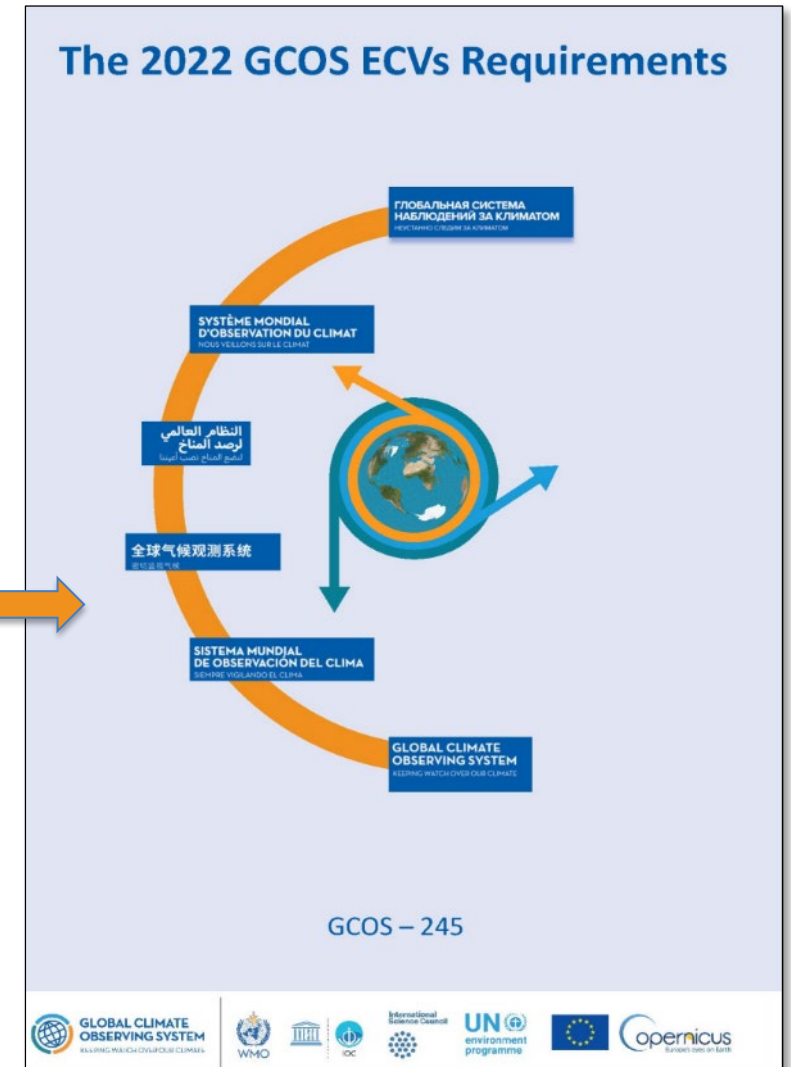
Biosphere is very important for the carbon and water cycles while many variables cover composition and transport that impact all aspects of climate change



The GCOS Implementation Plan and ECVs REquirements



- Published every \cong 5 years
- Submitted to UNFCCC
- Actions for addressing gaps and improvements of a fit for purpose Global Climate Observing System
- Published jointly with the 2022 GCOS IP
- Provides the observational requirements for 55 ECVs (and more ECV products)



WGC is supporting the implementation of the satellite relevant actions

GCOS IP and Space Agencies

Theme	Actions	Implementing Bodies												
		WMO	NMHS	Space agencies	GOOS	Reanalysis Centers	Global Data Centers	Research organizations	National Agencies	Parties to UNFCCC	Academia	Funding Agencies	GCOS	
A: ENSURING SUSTAINABILITY	A1. Ensure necessary levels of long-term funding support for in situ networks, from observations to data delivery	x	x					x				x	x	x
	A2. Address gaps in satellite observations likely to occur in the near future			x										
	A3. Prepare follow-on plans for critical satellite missions			x										
B: FILLING DATA GAPS	B1. Development of reference networks (in situ and satellite Fiducial Reference Measurement (FRM) programs)	x	x	x				x					x	x
	B2. Development and implementation of the Global Basic Observing Network (GBON)	x	x		x									x
	B3. New Earth observing satellite missions to fill gaps in the observing systems			x										
	B4. Expand surface and in situ monitoring of trace gas composition and aerosol properties		x					x	x				x	
	B5. Implementing global hydrological networks	x	x	x			x							
	B6. Expand and build a fully integrated global ocean observing system		x	x	x			x	x			x		
	B7. Augmenting ship-based hydrography and fixed-point observations with biological and biogeochemical parameters				x			x						
	B8. Coordinate observations and data product development for ocean CO ₂ and N ₂ O	x			x			x	x					
	B9. Improve estimates of latent and sensible heat fluxes and wind stress		x	x	x			x				x		
	B10. Identify gaps in the climate observing system to monitor the global energy, water and carbon cycles							x					x	x
C: IMPROVING DATA QUALITY, AVAILABILITY, AND UTILITY, INCLUDING REPROCESSING	C1. Develop monitoring standards, guidance and best practices for each ECV	x		x	x									x
	C2. General improvements to satellite data processing methods			x				x				x		
	C3. General improvements to in situ data products for all ECVs		x					x				x		
	C4. New and improved reanalysis products			x		x						x		
	C5. ECV-specific satellite data processing method improvements			x		x								
D: MANAGING DATA	D1. Define governance and requirements for Global Climate Data Centres	x					x							x
	D2. Ensure Global Data Centres exist for all in situ observations of ECVs	x	x		x				x				x	x
	D3. Improving discovery and access to data and metadata in Global Data Centres						x						x	x
	D4. Create a facility to access co-located in situ cal/val observations and satellite data for quality assurance of satellite products	x	x	x				x						
	D5. Undertake additional in situ data rescue activities	x	x									x		x
E: ENGAGING WITH COUNTRIES	E1. Foster regional engagement in GCOS	x			x							x		x
	E2. Promote national engagement in GCOS		x									x	x	x
	E3. Enhance support to national climate observations											x		x
F: OTHER EMERGING NEEDS	F1. Responding to user needs for higher resolution, real time data	x	x	x				x				x		x
	F2. Improved ECV satellite observations in polar regions			x				x				x		
	F3. Improve monitoring of coastal and Exclusive Economic Zones		x	x	x			x				x		
	F4. Improve climate monitoring of urban areas	x	x					x	x			x		x
	F5. Develop an Integrated Operational Global GHG Monitoring System	x		x				x	x			x		x

GCOS IP Actions with relevance for Space Agencies

Theme A: Ensuring Sustainability

Action A2: Address gaps in satellite observations likely to occur in the near future

Action A3: Prepare follow-on plans for critical satellite missions

Theme B: Filling Data Gaps

Action B1: Development of reference networks (in situ and satellite Fiducial Reference Measurement (FRM) programs)

Action B6: Expand and build a fully integrated global ocean observing system

Action B3: New Earth observing satellite missions to fill gaps in the observing systems

Action B9: Improve estimates of latent and sensible heat fluxes and wind stress

Action B5: Implementing global hydrological networks

GCOS IP Actions with relevance for Space Agencies

Theme C: Improving Data Utility

Action C1: Develop monitoring standards, guidance and best practices for each ECV

Action C5: ECV-specific Satellite Data Processing Method Improvements

Action C2: General Improvements to Satellite Data Processing Methods

Action C4: New and improved reanalysis products

Theme D: Managing Data

Action D4: Create a database of co-located in situ cal/val observations and satellite data for quality assurance of satellite products

Action F1: Responding to user needs for higher resolution, near real time data

Action F2: Improved ECV satellite observations in polar regions

Action F3: Improve monitoring of coastal and Exclusive Economic Zones

Action F5: Develop an Integrated Operational Global GHG Monitoring System

Theme F: Emerging Needs

Space Agency Response to the GCOS IP

WGC is coordinating the Space Agency Response to the GCOS IP

- A collaborative effort between WGC and GCOS experts
- Partially shared membership: WGC ex-officio members in GCOS Panels
- GCOS rapporteurs for each satellite actions have been identified
- Regular interactions between WGClimate chairs and GCOS Secretariat
- Regular reporting on progress on actions by WGC to GCOS, using an agreed template

Space Agency Response to the GCOS IP

Reporting template

Action A3	Prepare follow-on plans for critical satellite missions
<i>Activity A3.5</i>	<i>Sea ice and icebergs (or floating ice)</i>
Means of assessing progress	Established plans of Space agencies that ensure the continuation of satellite missions monitoring ice
WGClimate Coordinator(s)	Mark/Susanne/Wenying/Misako
GCOS IP rapporteur(s)	Stefan Kern / Belén Martín Míguez
Priority for WGClimate	Level of priority for WGClimate: 2023
Feasibility	<p>Is this activity feasible, will it be successful?</p> <p>If not, what are the reasons that would make this activity not feasible (technical, budget..).</p> <p>Is it only partially implementable? If this is the case, reformulate the activity (part of activity)</p> <p>If it is totally feasible, by when can the action be accomplished?</p>
Collaboration with GCOS	Would this activity benefit or require a tight collaboration with GCOS? If yes, how (see above)
Connections with other IP actions	Are there any connections to other GCOS IP activities? If yes, would it be better to address these activities together? If yes, reformulate
Timeline and milestone for this activity	
Date	Milestone
Date	Milestone
Date	Milestone

see WGC presentation

Progress report – June 2023: ...

Progress report – Dec. 2023: ...

ECV Rationalization Process

There are currently 55 ECV and over 200 ECV products.

- some ECVs measure similar properties in different domains;
- inconsistencies in the way ECVs and ECV products are understood by the three GCOS panels;
- poor reflection of earth cycles

A Task Team is being established:

1. Defining the governance of the process that must be followed for adoption of ECVs and ECV products/quantities
2. Revising the concept and definition for both an “ECV” and an “ECV product/quantity”
3. Once the criteria (activity 1) and definitions (activity 2) are clear, undertaking a revision of the existing ECVs and ECV quantities and producing a proposed new set of ECVs and ECV quantities.
4. Carrying out a consultation process review with selected users/stakeholders and with the broader community – **Space agencies to participate in the process review**

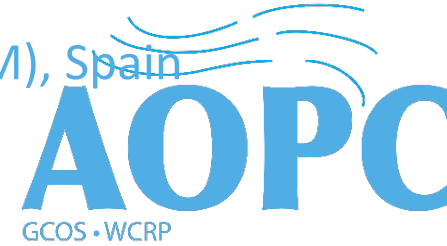
GCOS-led Activities relevant to Space Agencies

- ECVs Rationalization
- Climate Monitoring Principles
- Earth Climate Cycles
- GSRN - GCOS Surface Reference Network
- Air-Sea & Land-Air Fluxes
- AFOLU Road-Map
- Adaptation: importance of Reanalysis (including space observations)

Involvement from satellite agencies is needed

ECV Rationalization Task Team

- Peter Thorne, Maynooth University, Ireland - Chair
- Carmen GARCÍA IZQUIERDO, Spanish Metrology Center (CEM), Spain
- Blair TREWIN, Bureau of Meteorology, Australia
- Stephan BOJINSKI, EUMETSAT, Germany



- Rick LUMPKIN, NOAA, USA
- Katrin SCHROEDER, CNR-ISMAR, Italy
- Stefan KERN, ICDC, CEN, University of Hamburg, Germany



- Isabelle Gärtner Roer, University of Zurich, Switzerland
- Andreas Güntner, Helmholtz Centre Potsdam, Germany
- Martin Herold, GFZ Potsdam, Germany



External Experts

- Sarah Connors, ESA
- Carlo Buontempo, Copernicus Climate Change Service
- Gilberto Camara, INPE (TBC)

GCOS Activities

Update of the GCOS Climate Monitoring principles (GCOS IP Action C1.4)

- The GCOS climate monitoring principles are >20 years old: update needed.
- Principles were originally written for in-situ network and updated later to include satellite observations.
- The suggestion is to modify the document and remove the distinction between in situ and satellite observations.
- It was also discussed to consider the critical role that reference networks play for climate monitoring in helping to understand the total system.
- **First draft will be shared with WGClimate (November 2023)**

Thanks!

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