climate change initiative

LONG-LIVED GREENHOUSE GAS PRODUCTS PERFORMANCES

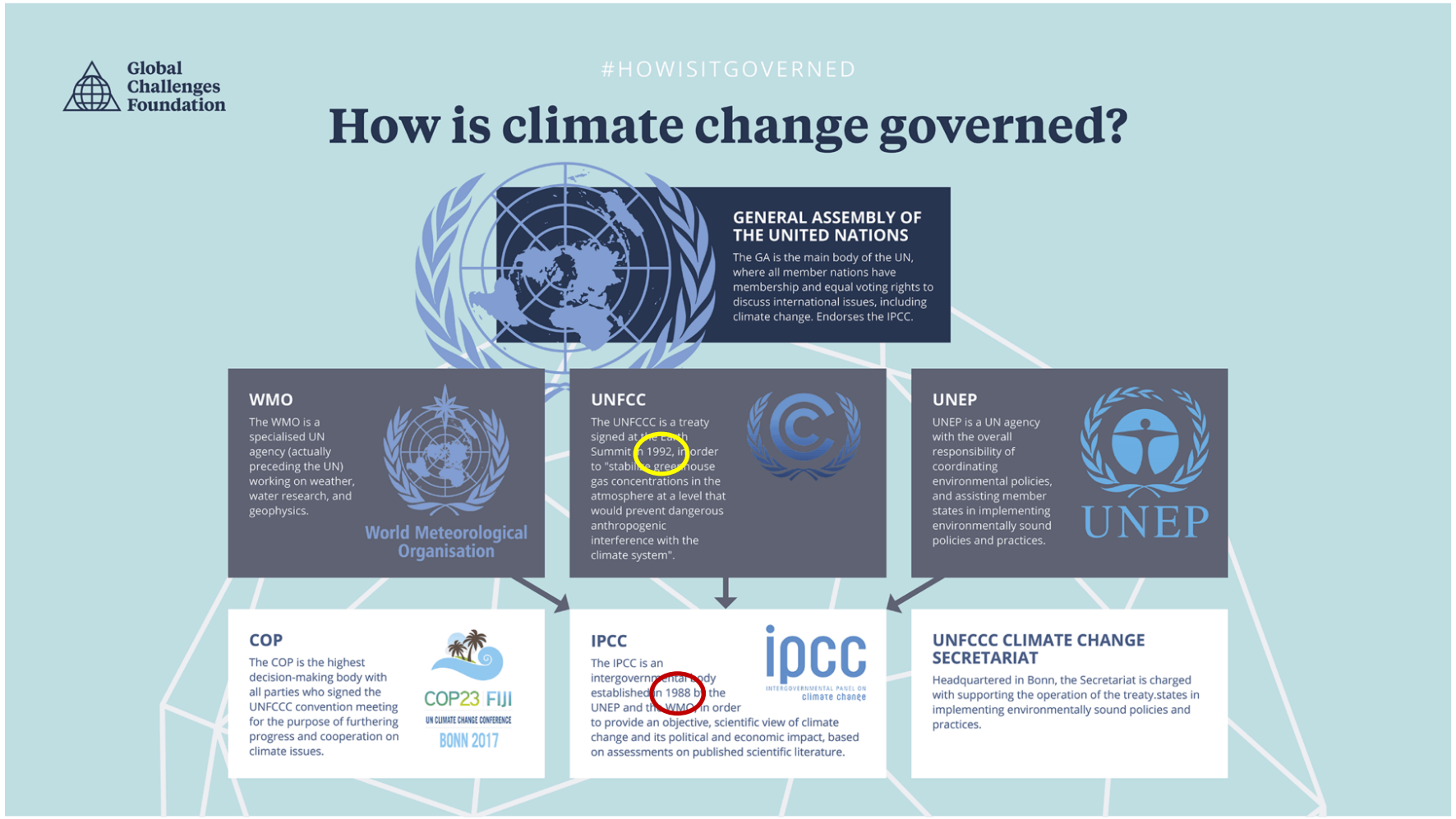
Insights into GCOS's mission for ECVs

Belén Martín Míguez (GCOS Secretariat)

A BIT OF CONTEXT

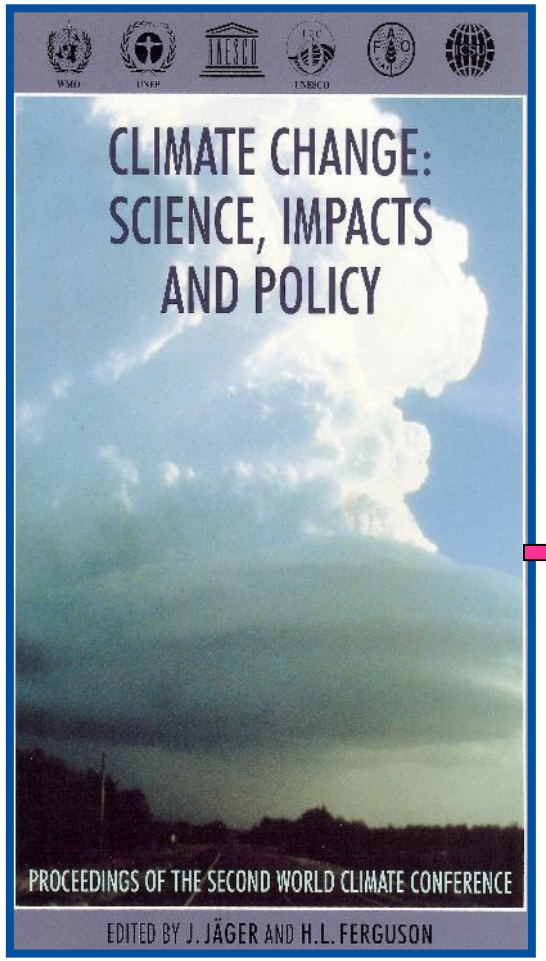
A BIT OF CONTEXT… WHY GCOS?

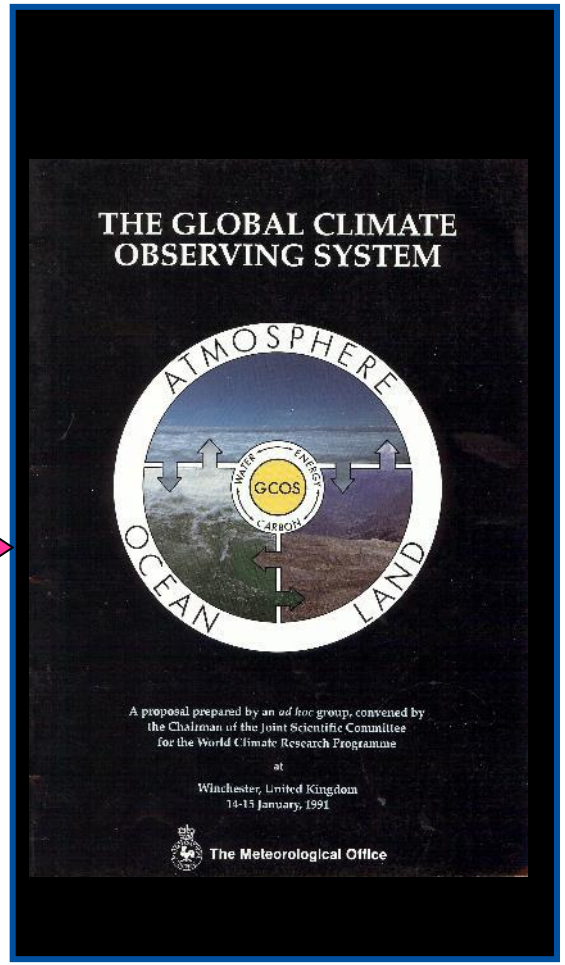
WHO TAKES CARE OF CLIMATE CHANGE



1992: GCOS IS CREATED

Winchester Proposal
January 1991





GCOS MOU
April 1992

WMO, IOC, UNEP and ICSU

- Noting 1-6
- Recognizing…..
- Considering…
- Agree 1-5
- Agree further….
- Approve:
  - Annex A
  - Annex B
  - Annex C
- Agree….
- Agree….
- Agree….

Annex A Concept of the Global Climate Observing System

Annex B Terms of Reference, Structure and Functions of the JSTC and JPO

Annex C Financial Arrangements

GCOS MISSION

GLOBAL CLIMATE OBSERVING SYSTEM

KEEPING WATCH OVER OUR CLIMATE

GCOS works towards **climate observations** being **enhanced** and **sustained** into the future, to provide the evidence needed to understand and predict the evolution of the climate, to guide mitigation and adaptation measures, to assess risks and enable attribution of climatic events to underlie causes, and to underpin climate services.

GCOS = Climate Observations
enabling climate science and services

AOPC ATMOSPHERE OCEAN LAND GCOS

OOPC TOPC

GCOS cooperates with a wide range of observing initiatives

GCOS does not make observations itself, it is a system of systems integrating the contribution from a wide range of organizations, networks and observing systems **(in situ and space-based)**

NATIONAL GCOS

GSN, GUAN, GRUAN

WHOS

GBON

…

WHYCOS

GAW

Meteorological Networks coordinated by WMO

GOOS (under IOC) coordinates a wide range of ocean networks

Global Ocean Observing System

LEGOS

FAO

FLUXNET

wgms

Other Global Organizations and Networks for specific terrestrial ECV

CGMS

CEOS

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

Examples of global networks associated with GCOS

GTN-P Global Terrestrial Network for Permafrost

GTN-H

GTN-G

GOFC-GOLD

WRMC-BSRN World Radiation Monitoring Center- Baseline Surface Radiation Network

HYDROLARE

Copernicus Europe's eyes on Earth

GRDC

WCRP

NOAA

GLOBAL PRECIPITATION CLIMATOLOGY CENTRE

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

Examples of national and regional networks

eLTER

ICOS

AMERIFLUX

tern Ecosystem Research Infrastructure

GLOBAL CLIMATE OBSERVING SYSTEM

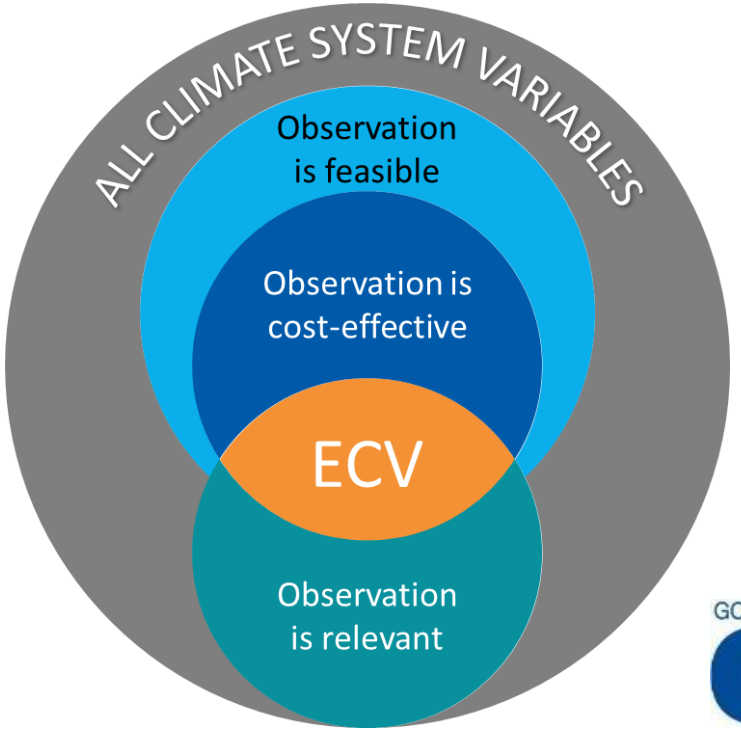
KEEPING WATCH OVER OUR CLIMATE

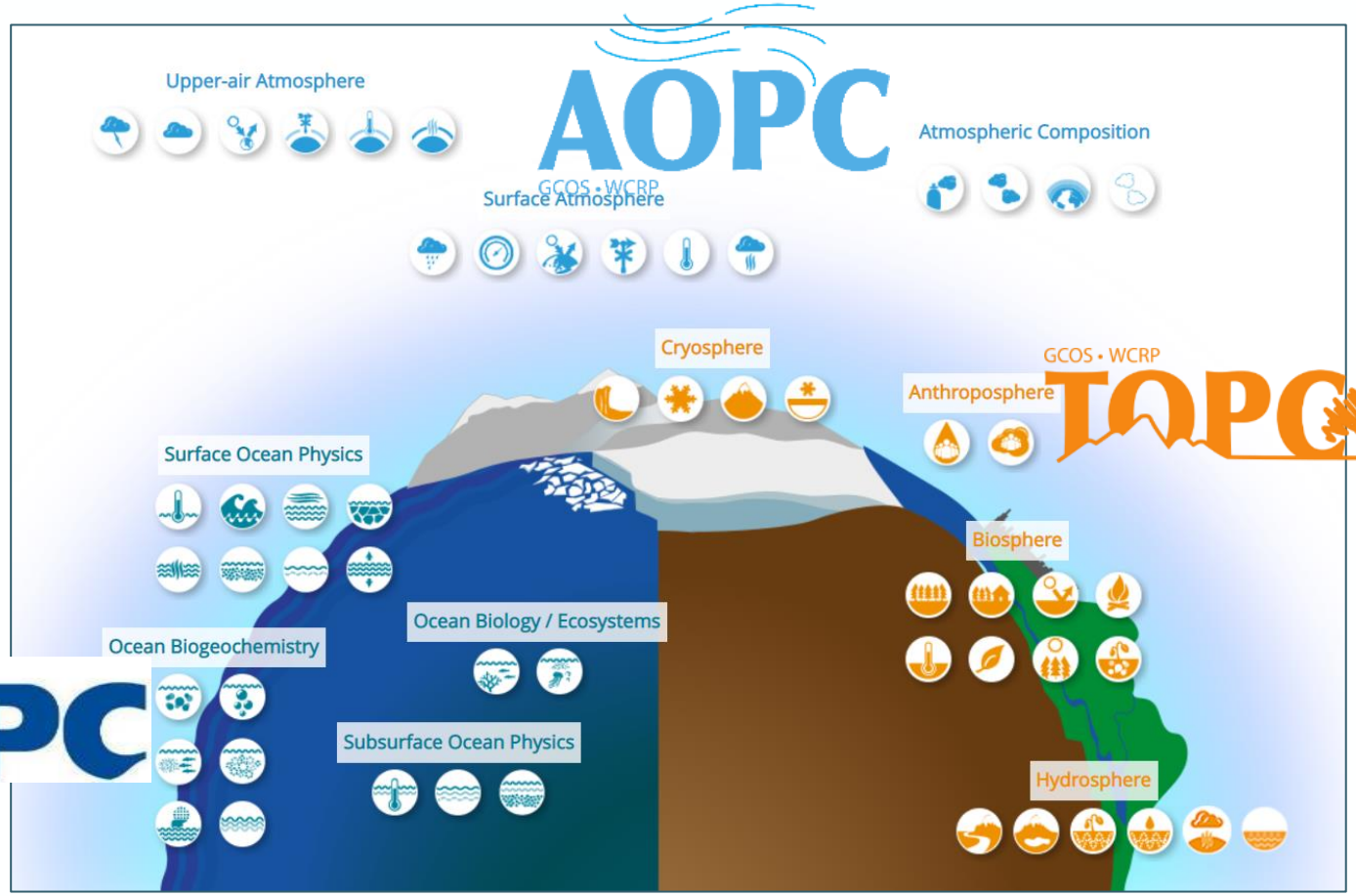
Climate observations…

WHAT CLIMATE OBSERVATIONS?

AOPC ATMOSPHERE OCEAN LAND GCOS OOPC TOPC

GCOS 55 ECVs - Essential Climate Variables

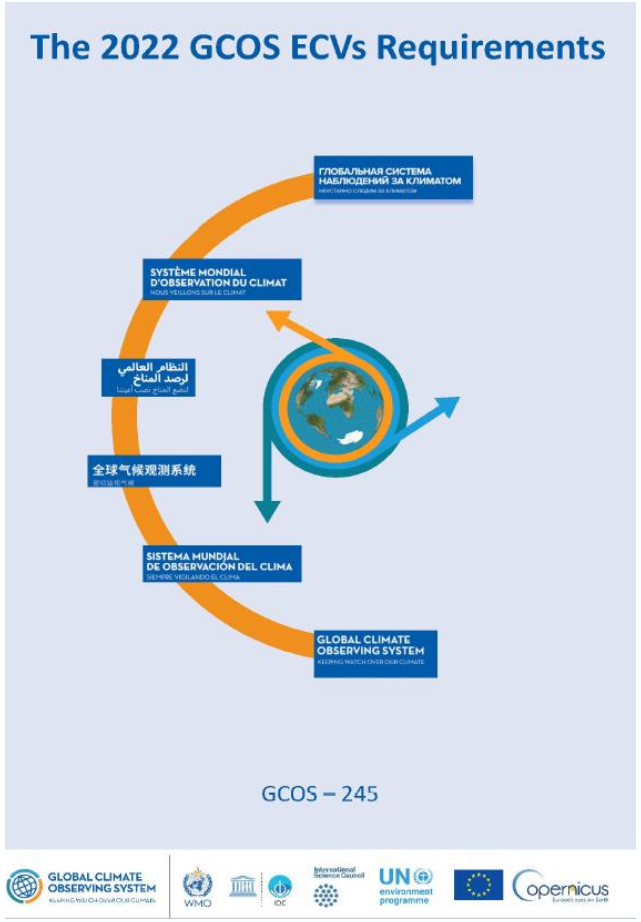




Essential Climate Variables (ECV)

- are physical, chemical or biological variables that critically contribute to the characterization of Earth's climate.
- are not of stand-alone variables; they are part of a wider concept.
- are founded on climate science and observational capability and infrastructure. SOURCE: Bojinski, S. et al., 2014

ECVs Observational requirements



3.2.6 ECV Product: Ozone Total Column

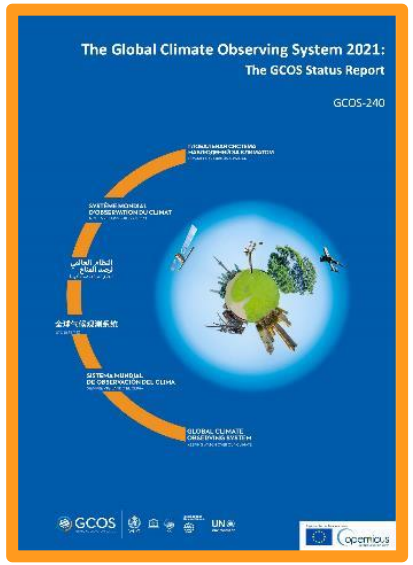
Name	Ozone Total Column				
Definition	2D field of total amount of O3 molecules per unit area in an atmospheric column extending from the Earth's surface to the upper edge of the atmosphere.				
Unit	% (directly transferrable to Dobson units)				
Note	The team of ozone experts unanimously agreed that the uncertainty and stability requirements for each of these ozone data products should be expressed as % and %/decade in the tables. Defining requirements in units of mixing ratios or Dobson Units would require each uncertainty and stability requirement be a wide range of values. We therefore found it more definitive and intuitive that each table entry is one number in % or %/decade. To help translate the requirements in % or %/decade to absolute units we have put a footnote beneath each table that quantitatively describes the wide range of mixing ratios or Dobson Units corresponding to that data product. This helps to explain why the requirements in the tables are not expressed in units of mixing ratio or DU. Requirements in absolute units are easily calculated by multiplying the % (or %/decade) in the table by the mixing ratio or DU ranges in the footnotes.				
Requirements					
Item needed	**Unit**	**Metric**	**[1]**	**Value**	**Notes**
Horizontal Resolution	km		G	20	1, 2, 3, 4
			B	100	
			T	500	
Vertical Resolution			G	-	N/A
			B	-	
			T	-	
Temporal Resolution	d		G	1/24	1, 2, 3, 4
			B	1	
			T	30	
Timeliness	d		G	1/24	
			B	1	
			T	30	
Required Measurement Uncertainty (2-sigma)	%		G	1	1, 2, 3, 4
			B	2	Requirements for uncertainty (%) and stability (%/decade) translate to wide Dobson Unit requirement ranges based on a 200 to 500 DU range of ozone total columns.
			T	3	
Stability	%/decade		G	1	1, 2, 3, 4
			B	2	Requirements for uncertainty (%) and stability (%/decade) translate to wide Dobson Unit requirement ranges based on a 200 to 500 DU range of ozone total columns.
			T	3	
Standards and References	1. Ozone Climate Change Initiative User Requirements Document http://cci.esa.int/sites/default/files/filedepot/incoming/Ozone_cci_urd_v3.0_final.pdf 2. WMO (World Meteorological Organization), Stratospheric Ozone Changes and Climate in Scientific Assessment of Ozone Depletion: 2018, Global Ozone Research and Monitoring Project–Report No. 58, 588 pp., Geneva, Switzerland, 2018. https://www.esrl.noaa.gov/csd/assessments/ozone/2018/downloads/Chapter5_2018OzoneAssessment.pdf 3. Climate Monitoring User Group CCI Requirements Baseline Documents http://ensembles-eu.metoffice.com/cmug/CMUG_PHASE_2_D1.1_Requirements_v0.6.pdf 4. WMO (World Meteorological Organization), Update on Global Ozone: Past, Present and Future in Scientific Assessment of Ozone Depletion: 2018, Global Ozone Research and Monitoring Project–Report No. 58, 588 pp., Geneva, Switzerland, 2018. https://www.esrl.noaa.gov/csd/assessments/ozone/2018/downloads/Chapter3_2018OzoneAssessment.pdf				

GCOS is acknowledged as the **leading independent reference in defining the requirements for climate observations** (spatial & temporal resolutions, uncertainty, stability,…)

GCOS Main Publications - Reporting to UNFCCC

GCOS is mandated to report to UNFCCC on Research and Systematic Observations

GCOS Status Report



Identify gaps and assess if the status of the observing system for climate meets those requirements

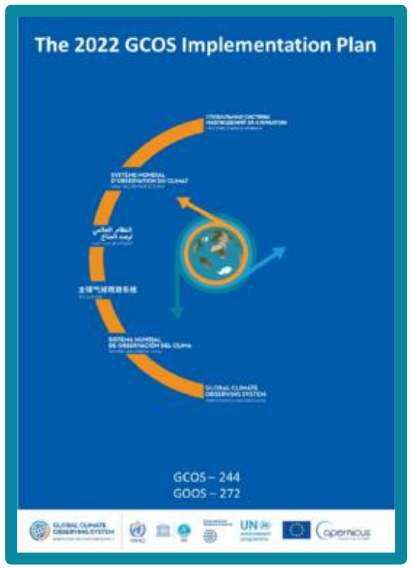
≃ 5 years cycle

ECVs

REQUIREMENTS

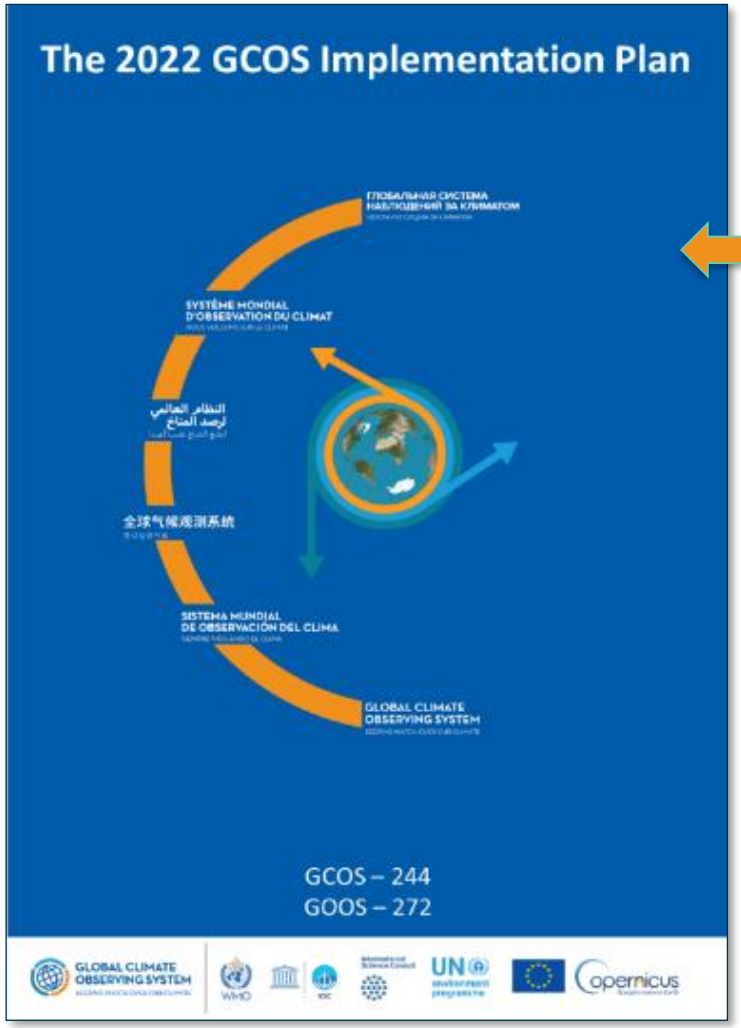
Identify what/how we need to measure

GCOS Implementation Plan



Propose actions for addressing gaps and improving the global observing system for climate

GCOS Implementation Plan 2022 and Space Agencies' Response



- Published every ≃5 years
- Actions for addressing gaps and improvements of a fit for purpose Global Climate Observing System
- Submitted to UNFCCC
- UNFCCC encourages Parties and international organizations to support GCOS and undertake its Implementation Plan.

- Published by the space agencies, under the umbrella of WGClimate
- It addresses key priorities
- and ensures alignment with international climate observation objective

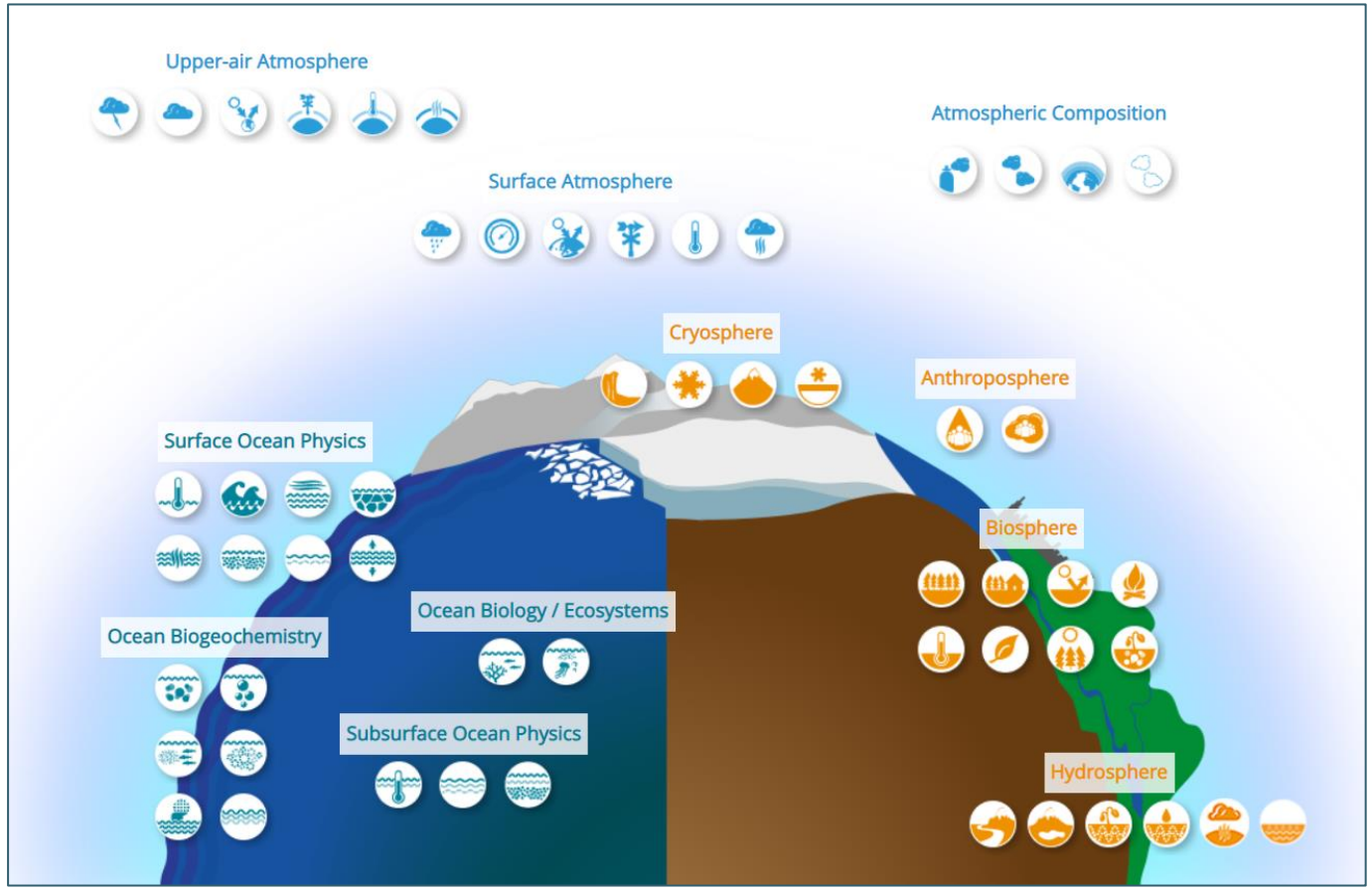
GCOS ECVs Rationalization

After 20 years of ECV framework:

Are all the 55 Essential Climate Variables **still essential**? Are we **missing anything**?

Is the **current grouping the best possible** one? Is it **balanced**? Is it **consistent** across domains and across earth cycles?

Is there **enough transparency** and **coherence** in the process that leads to including a new ECV in the list?



GCOS ECVs Rationalization timeline

TT set up

13 Virtual Meetings, **2** in person meetings

Consultation with stakeholders

9 one-to-one interviews

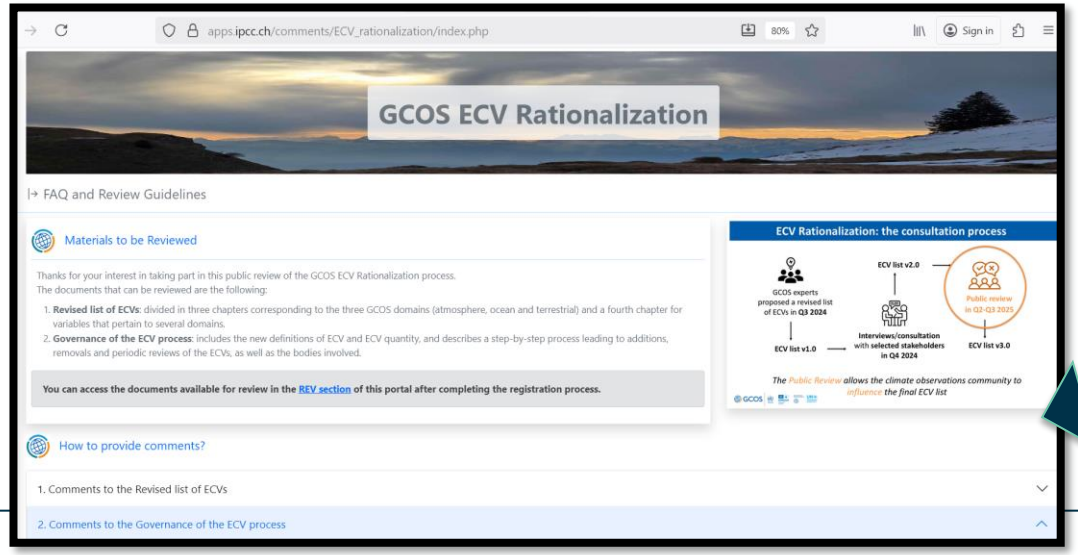
ECV Rationalization announced through distribution lists (15), newsletters (3), posters (1) and talks (7)

PUBLICATION OF A RESPONSE

Preparation and submission of a paper

Venice 3d in person

2023 Q3	2023 Q4	2024 Q1	2024 Q2	2024 Q3	2024 Q4	2025 Q2-Q3	2026



Public Review

289 comments

PAPER submitted

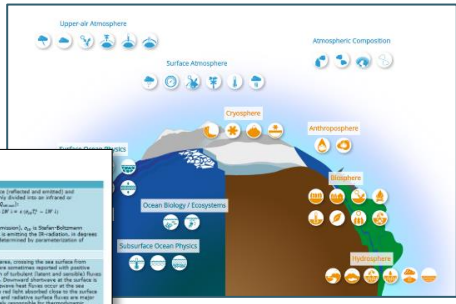
The new list will only enter into force with the new Implementation Plan (2028)

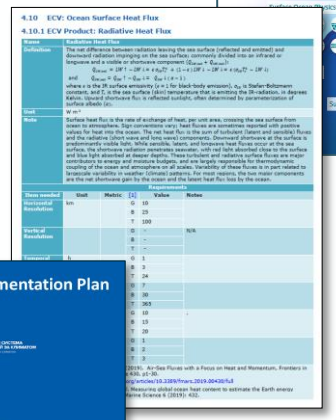
WHY GCOS MATTERS

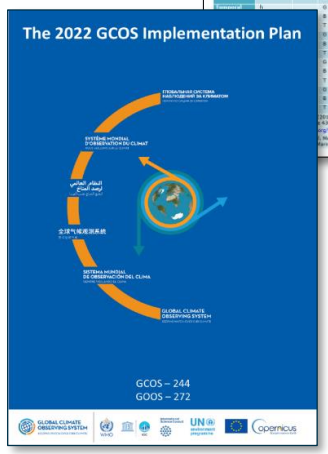
GCOS programme **selects** what variables are more relevant for climate studies

GCOS **defines** how those variables should be measured (requirements)

GCOS **identifies** where are the main deficiencies provides recommendations to address those



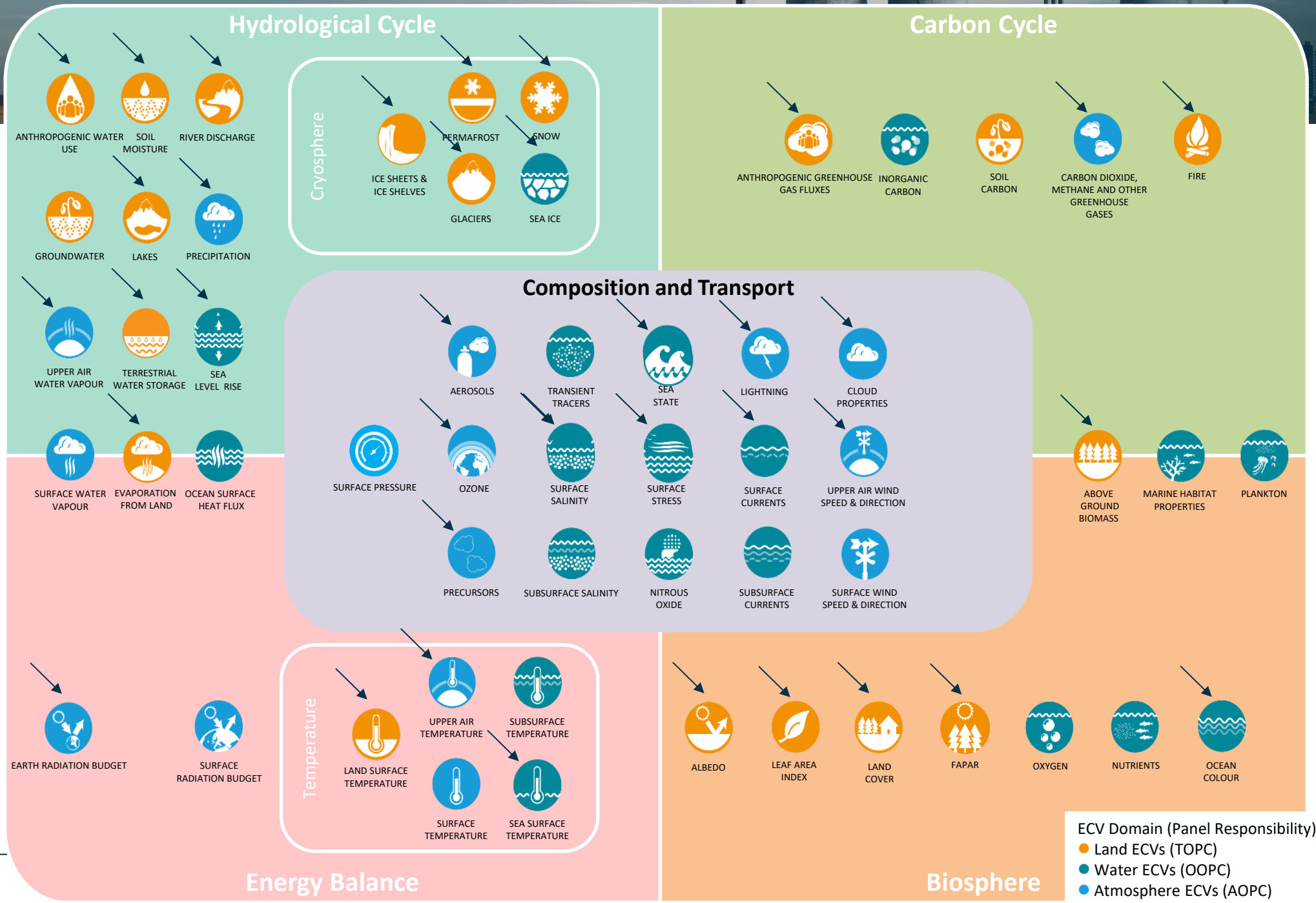




GCOS advocates **again, again and again** for an observing system for climate that is sustained and allows to have continuous and reliable time series

…and GCOS is concerned

55 ECVs - 37 can be measured from space… but the system is sub-optimal for most of the variables



THANK YOU

lolipop
cci