30th GCOS Steering Committee

7-8 December 2022

Item 2.2 – ECV Rationalization

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GCOS SC 2021 Decisions & Actions

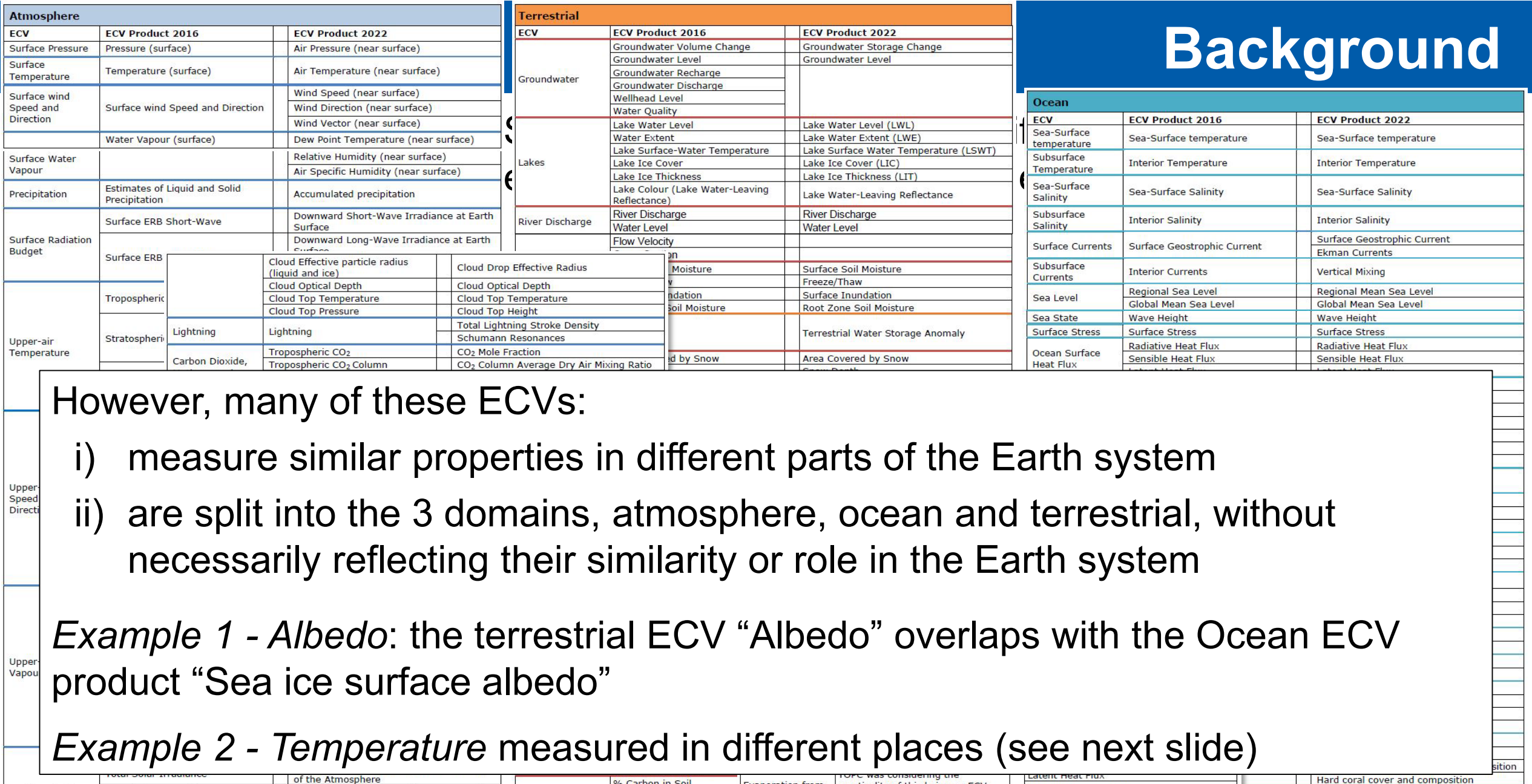
- DECISION Dec.29/1 - The Steering Committee agreed to rationalize the ECVs, presenting similar ECV Products grouped together under one ECV.

- ACTION SC 29/4 - Secretariat in consultation with the panel co-chairs to propose a new grouping of ECVs which can be discussed in the panels and the next SC and ideally form the basis of the new IP.

- ACTION SC 29/5 - Stakeholders and users will be approached to explain the idea about the rationalization and reinsure them that there will be no direct impact on their work. If their reactions are positive, GCOS can move forward.

- ACTION SC 29/6 - The GCOS Sec, together with the panel chairs and couple of volunteers from the SC, will work on the rationalization of the ECVs.

Background



Atmosphere			
ECV	ECV Product 2016		ECV Product 2022
Surface Pressure	Pressure (surface)		Air Pressure (near surface)
Surface Temperature	Temperature (surface)		Air Temperature (near surface)
Surface wind Speed and Direction	Surface wind Speed and Direction		Wind Speed (near surface)
			Wind Direction (near surface)
			Wind Vector (near surface)
	Water Vapour (surface)		Dew Point Temperature (near surface)
Surface Water Vapour			Relative Humidity (near surface)
			Air Specific Humidity (near surface)
Precipitation	Estimates of Liquid and Solid Precipitation		Accumulated precipitation
Surface Radiation Budget	Surface ERB Short-Wave		Downward Short-Wave Irradiance at Earth Surface
	Surface ERB		Downward Long-Wave Irradiance at Earth Surface
Upper-air Temperature	Tropospheric		
	Stratospheri		
Upper-air Speed Directi			
Upper-air Vapou			
Earth Radiation Budget			of the Atmosphere
	Top of the Atmosphere ERB Long-Wave		Upward Long-Wave Irradiance at Top of the Atmosphere
	Top of the Atmosphere ERB Short-Wave		Upward Short-Wave Irradiance at Top of the Atmosphere
			Radiation Profile
Cloud Properties	Cloud Amount		Cloud Cover
			Cloud Liquid Water Path

		Cloud Effective particle radius (liquid and ice)	Cloud Drop Effective Radius
		Cloud Optical Depth	Cloud Optical Depth
		Cloud Top Temperature	Cloud Top Temperature
		Cloud Top Pressure	Cloud Top Height
	Lightning	Lightning	Total Lightning Stroke Density
			Schumann Resonances
	Carbon Dioxide,	Tropospheric CO_2	CO_2 Mole Fraction
		Tropospheric CO_2 Column	CO_2 Column Average Dry Air Mixing Ratio

Terrestrial			
ECV	ECV Product 2016		ECV Product 2022
Groundwater	Groundwater Volume Change		Groundwater Storage Change
	Groundwater Level		Groundwater Level
	Groundwater Recharge		
	Groundwater Discharge		
	Wellhead Level		
	Water Quality		
Lakes	Lake Water Level		Lake Water Level (LWL)
	Water Extent		Lake Water Extent (LWE)
	Lake Surface-Water Temperature		Lake Surface Water Temperature (LSWT)
	Lake Ice Cover		Lake Ice Cover (LIC)
	Lake Ice Thickness		Lake Ice Thickness (LIT)
	Lake Colour (Lake Water-Leaving Reflectance)		Lake Water-Leaving Reflectance
River Discharge	River Discharge		River Discharge
	Water Level		Water Level
	Flow Velocity		
	Moisture		Surface Soil Moisture
			Freeze/Thaw
	ndation		Surface Inundation
	oil Moisture		Root Zone Soil Moisture
			Terrestrial Water Storage Anomaly
	d by Snow		Area Covered by Snow
Soil Carbon	% Carbon in Soil		
	Mineral Soil Bulk Density t and 1 M		
	Peatlands Total Depth of P		
	Area and Location		
Fire	Burnt Areas		
	Active Fire Maps		Active Fires
	Fire Radiative Power		Fire Radiative Power (FRP)

Evaporation from Land	TOPC was considering the practicality of this being an ECV (Latent and Sensible Heat Fluxes) and, if so, what the requirements might be.	Latent Heat Flux
		Bare Soil Evaporation
		Interception Loss
		Transpiration
Anthropogenic Water Use	Anthropogenic Water Use	Anthropogenic Water Use

Ocean		
ECV	ECV Product 2016	ECV Product 2022
Sea-Surface temperature	Sea-Surface temperature	Sea-Surface temperature
Subsurface Temperature	Interior Temperature	Interior Temperature
Sea-Surface Salinity	Sea-Surface Salinity	Sea-Surface Salinity
Subsurface Salinity	Interior Salinity	Interior Salinity
Surface Currents	Surface Geostrophic Current	Surface Geostrophic Current
		Ekman Currents
Subsurface Currents	Interior Currents	Vertical Mixing
Sea Level	Regional Sea Level	Regional Mean Sea Level
	Global Mean Sea Level	Global Mean Sea Level
Sea State	Wave Height	Wave Height
Surface Stress	Surface Stress	Surface Stress
Ocean Surface Heat Flux	Radiative Heat Flux	Radiative Heat Flux
	Sensible Heat Flux	Sensible Heat Flux
		Hard coral cover and composition

However, many of these ECVs:

i) measure similar properties in different parts of the Earth system

ii) are split into the 3 domains, atmosphere, ocean and terrestrial, without necessarily reflecting their similarity or role in the Earth system

Example 1 - Albedo: the terrestrial ECV “Albedo” overlaps with the Ocean ECV product “Sea ice surface albedo”

Example 2 - Temperature measured in different places (see next slide)

Example: ECV Temperature

Domain	ECV	ECV Product
Atmosphere	1 Temperature (surface)	Atmospheric Temperature near Surface
	2 Temperature (upper-air)	Atmospheric Temperature in the PBL
		Atmospheric Temperature in the free Troposphere
		Atmospheric Temperature in the UTLS
		Atmospheric Temperature in the Middle and Upper Stratosphere
		Atmospheric Temperature in the Mesosphere
	3 Cloud properties	Cloud Top Temperature
Ocean	4 Sea Surface Temperature	Sea Surface Temperature
	5 Subsurface Temperature	Interior Temperature
	6 Ice	Sea Ice Surface Temperature (IST)
Terrestrial	7 Land Surface Temperature	Maps of land surface temperature
		Soil Temperature
	8 Lake	Lake Surface Water Temperature (LSWT)
	9 Permafrost	Permafrost Temperature (PT)

Example: ECV Temperature

From 9 to 1 ECV!

Panel	New ECV	ECV Product
AOPC	Temperature	Atmospheric Temperature near Surface
		Atmospheric Temperature in the PBL
		Atmospheric Temperature in the free Troposphere
		Atmospheric Temperature in the UTLS
		Atmospheric Temperature in the Middle and Upper Stratosphere
		Atmospheric Temperature in the Mesosphere
		Cloud Top Temperature
OOPC		Sea Surface Temperature
		Ocean Subsurface Temperature
		Sea Ice Surface Temperature (IST)
TOPC		Land surface temperature
		Soil Temperature
		Lake Surface Water Temperature (LSWT)
		Permafrost Temperature (PT)

“rationale” of rationalisation

Combining ECVs and/or clustering them into fewer groups shall:

- Reduce the ECV numbers
- Improve consistency across ECV products, domains, and climate cycles
- Facilitate the use of the ECVs by different users
- Strengthen collaboration between GCOS Panels

Proposal: ECVs Rationalisation

A team with 2 representatives from each panel, appointed by the panel chairs, shall identify how sets of ECV products should best be grouped and make preliminary proposals by June 2023, to be presented at the Joint Panel meeting.

Following this:

- Relevant panel members should refine, involving relevant stakeholders, each ECV group to be presented for approval at SC 31.
- A document describing the rationale and process is prepared and distributed among GCOS users.
- GCOS sec should propose a publicity plan to SC 31
- A paper could be published in BAMS to update the 1st Bojinski paper on ECVs

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Proposal: formal process for new ECVs

Currently new ECVs are proposed by GCOS Panels and approved by the Steering Committee (without any established process).

A formal process for the adoption of new ECVs and products could consider:

- is the new ECV / product significant (essential) for climate studies?
- does this new ECV / product already exists within the other domains?
- what are the criteria to assign a product to a certain ECV?
- demonstration that the new ECVs meet the criteria in Bojinski et al. 2014 (i.e. feasibility, relevance, and cost effectiveness)

Following agreement by all the panel chairs, each proposal should be forwarded to the SC for final approval.

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DRAFT DECISION (3)

The Steering Committee decides that GCOS should implement the workplan on ECV rationalization described in document 2.2 (and in this PPT)

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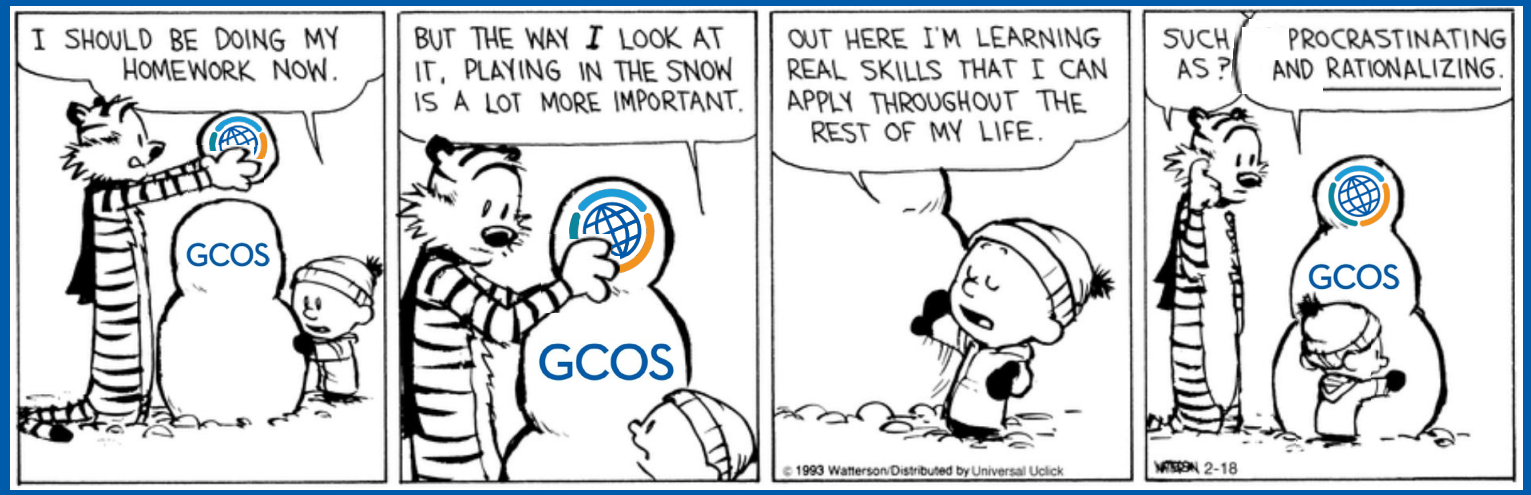
Thank you!



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