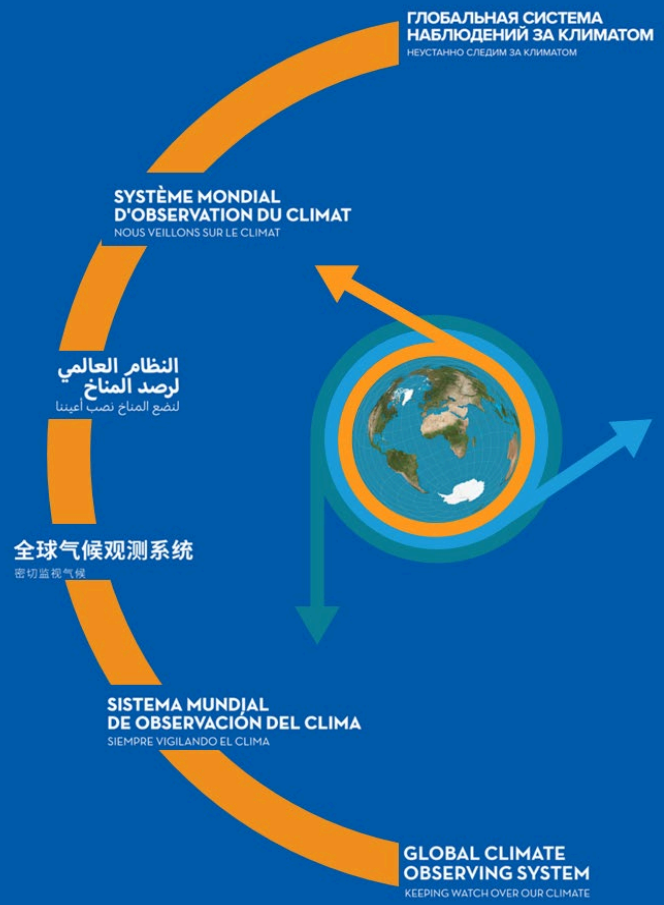


GCOS ECV Rationalization

Peter Thorne

Deputy Chair GCOS Steering Committee
Chair GCOS Atmospheric Observations Panel for Climate
Chair, GCOS Task Team on ECV Rationalisation

GLOBAL CLIMATE OBSERVING SYSTEM
KEEPING WATCH OVER OUR CLIMATE

WMO

unesco
Intergovernmental Oceanographic Commission

International Science Council

UN environment programme

Supported by the European Union

opernicus
Europe's eyes on Earth

This slide is simply the outline, so that you understand the structure

1. Presentation of the ECVs and ECV products
2. Why we needed an ECV Rationalization
3. Scope of the consultation and how it will work
4. Definitions: CURRENT and FUTURE
5. Governance: CURRENT and FUTURE
6. Typology of changes (2 slides)
7. Examples per each type of change
8. Overview (2 slides)
9. Next steps

Until now

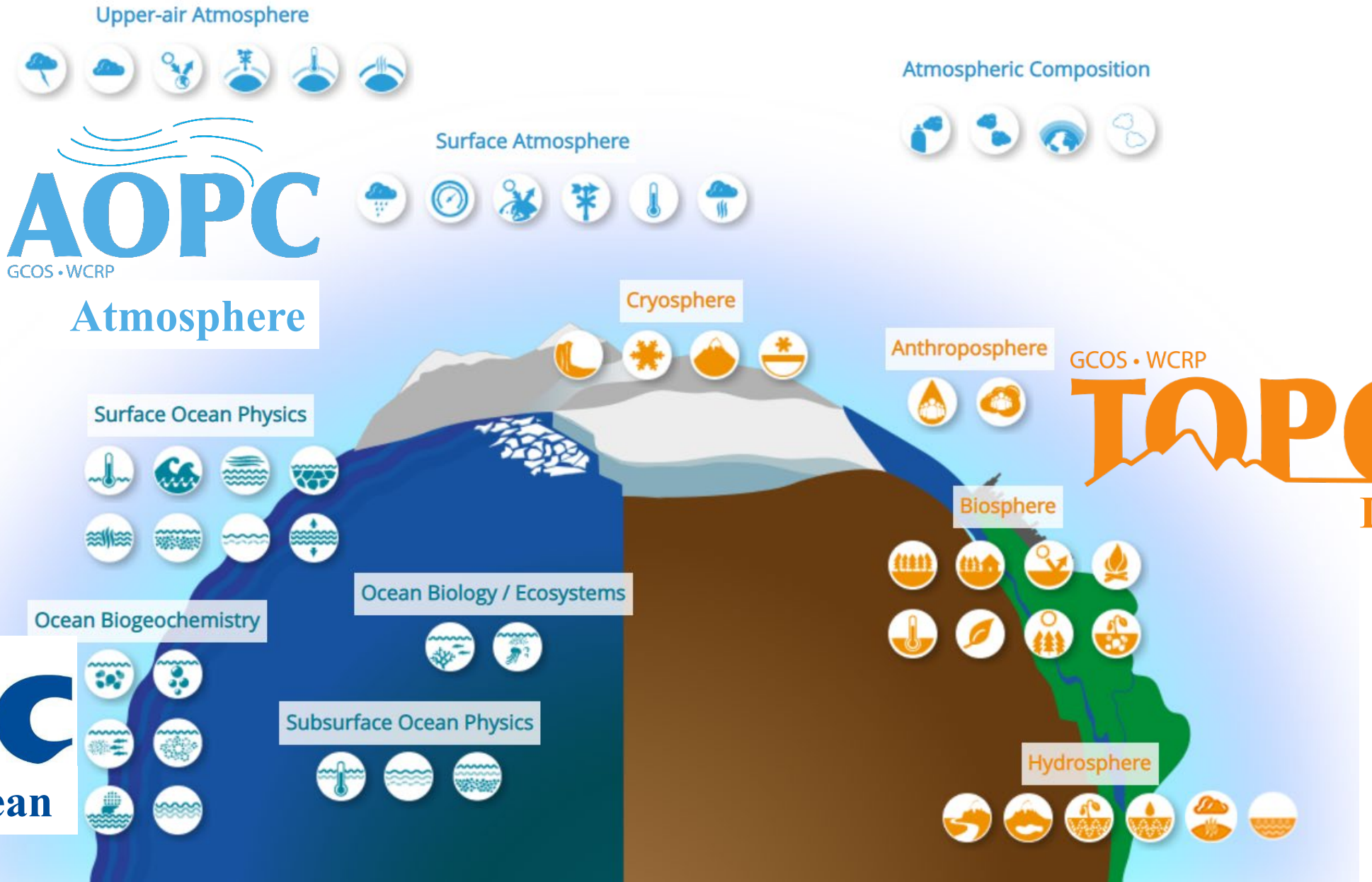
Time	Activity	Responsible
Q3 2024	Consultation of ECV/ECV quantities list v.1 with GCOS panels	GCOS officers
Q3 2024	Preparation of materials to be used during the consultation with key stakeholders	TT chair and Secretariat
MILESTONE Sep 2024	• ECV/ECV quantities list v.2 • Materials for consultation process finalised • Final list of key stakeholders	TT
Q4 2024	10-15 structured interviews with stakeholders	TT chair and Secretariat and TT members
Q1 2025	Analysis of the results from the interviews and preparation of material for public review	TT chair, Secretariat and TT members
MILESTONE March 2025	• ECV/ECV quantities list v.3 • Materials for public review, including PPT to inform in Conferences finalised	TT (online meeting)
Q2 2025	Public Review	GCOS Secretariat
Q3 2025	Analysis of the results from the public review	TT chair, Secretariat and TT members
MILESTONE End of 2025	• ECV/ECV quantities list v.4 • Draft 0 of an ECV paper describing the process and introducing the new ECVs and procedures	TT **(final in person meeting)**

55 Essential Climate Variables

ECV Criteria

Observation is:

- *Feasible*
- *Cost-effective*
- *Relevant*



55 Essential Climate Variables… and 200 ECV products

Sea Ice

Sea ice variability is a key indicator of climate variability and change in the polar regions. The primary parameters that define the state of sea ice include: concentration, area and extent, ice type, motion, deformation, age, thickness, and volume. The presence of sea ice strongly modifies surface waves and air-sea exchanges of heat, momentum, moisture and gases. Sea ice has a significant impact on the Earth's albedo and hence changes in Sea Ice impact the global energy budget. The properties of many water masses of the global ocean and strongly influenced determined freezing and melting processes in sea ice regions.

Domain:	Ocean
Subdomain:	Physical
Scientific Area:	Snow and Ice
ECV Steward:	Thomas Lavergne/Stefan Kern
Products:	Sea Ice Concentration; Sea Ice Thickness; Sea Ice Drift; Sea Ice Age; Sea Ice Temperature; Sea Ice Surface Albedo; Snow Depth on Sea Ice

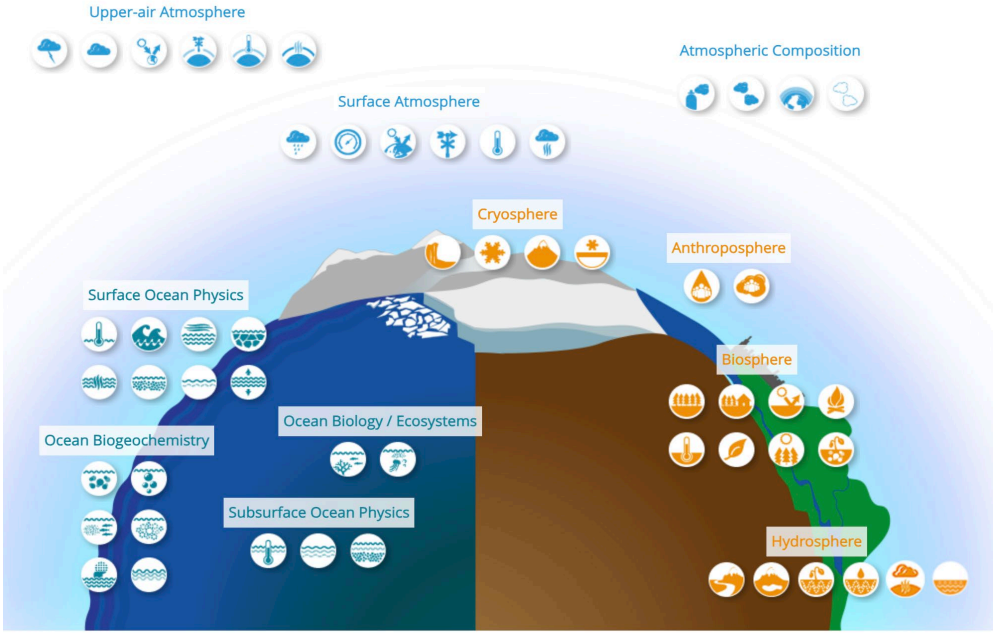
Products are "measurable parameters needed to evaluate the ECV" (GCOS-245, 2022)

GCOS WMO unesco International Science Council UN environment programme

Why do we need an ECV Rationalization process

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?



Understanding the consultation

- GCOS experts working across panels for 9 months have come up with a revised list of ECVs.
- Community buy-in will be sought through a:

Interview/consultation
with **selected stakeholders**

Public review
(similar to the one followed for IPCC or GCOS IP)

- The consultation with selected stakeholders allows them to **influence the process** before the public review

Understanding the consultation

GCOS will take all feedback to account, but this is a multi-actor process with clear goals w **compromises will be needed**

- The ECV Rationalizatio s comprises:
  - (1) are selected);
  - (2) the de);
  - (3) the list of EC) itself

NOTHING IS FINAL UNTIL EVERYTHING IS FINAL

IMPORTANT: focus on th pict e looking into the details (overall result of the ECV rat ation process cific ECV/ECV quantity)

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GOVERNANCE

CURRENT

- Only **best practices**, not a formal process.
- Proposals to add ECVs are submitted by groups of experts (very often connected to the panels), and **panels evaluate them** according to the three main criteria: (1) feasibility; (2) cost-effectiveness; 3) relevance.
- **GCOS Steering Committee** takes the ultimate decision (include or not the new ECV).
- The best practices **only concern the inclusion of new ECVs** to the list (not the ECV products).

FUTURE

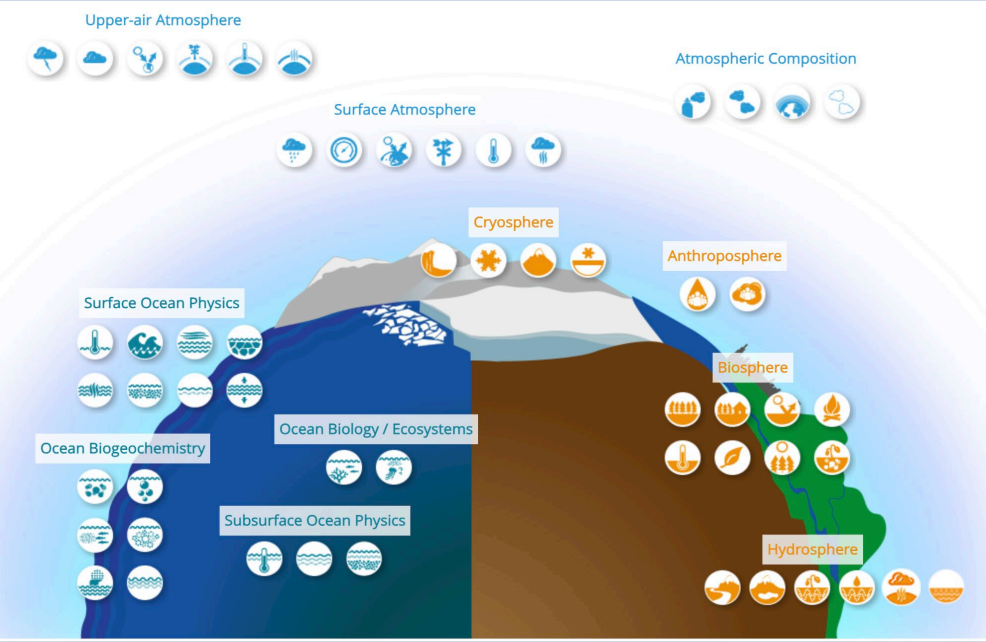
- **Formal process** designed including:
  - **Bodies involved** and **clear delineation of roles** between the panels, the GCOS Steering Committee, and a cross-panel ECV Board
  - **Instructions** on how to submit the proposal, and how to justify it, including a template
  - **Details** on the evaluation process and evaluation criteria including timeline
- The **process differentiates** between submission of new ECVs and submission of ECV products (now called quantities)

DEFINITIONS

CURRENT (GCOS-245, 2022)

- An **Essential Climate Variables (ECV)** is a physical, chemical or biological variable (or group of linked variables) that critically contributes to the characterization of Earth's climate.

- An **ECV product** is a measurable parameter needed to characterize the ECV.



FUTURE

ECV products renamed as ECV quantities (to indicate more clearly that these are measurable aspects that can be quantified in some way) and the ECV definition has been modified to show that they can comprise multiple quantities.

- **ECV quantity**: property of phenomenon, body, or substance, where the property has a magnitude that can be expressed as a number and a reference[1]. An ECV may be described by one or more such quantities. Categorical quantities are possible (e.g. precipitation type, land cover class).

- An **Essential Climate Variable (ECV)** is a singular quantity or a collective set of well-defined quantities that critically contribute to the characterization of Earth' s climate. ECV quantities can be physical, chemical or biological.

[1] International vocabulary of metrology – Basic and general concepts and associated terms (VIM)

CATEGORIES OF CHANGES

ECVs
ELIMINATE
NEW
COMBINE
TERMINOLOGY

ECV quantities		
~~**Eliminate**~~	~~**Eliminate**~~	~~**Eliminate**~~
New	New	New
→ *Moved to another ECV*	→ *Moved to another ECV*	→ *Moved to another ECV*
Terminology	***Terminology***	***Terminology***

ECV

AOPC	*OOPC*	*TOPC*

ECV quantities

AOPC	*OOPC*	*TOPC*

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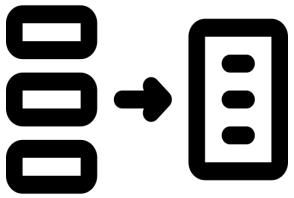
Typology of changes

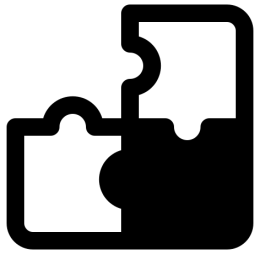


1. Combining :

- Some ECVs were the same at different heights or depths;
- Other ECVs or ECV quantitites were repeated across panels (e.g. Albedo)

IMPORTANT: There are now **four cross-panel ECVs**

(CH_4 and Short-lived GHG, CO_2 and Long-lived GHG, Albedo, Turbulent Heat Fluxes)



2. Organizing differently :

- ECVs have become ECV quantities and regrouped under a new ECVs (Ocean tracers moved under Ocean circulation);
- ECV quantities have been re-located under a different ECV (Soil temperature moved under Soil Physics)

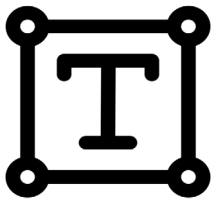
Typology of changes

3. Removing :

- The Anthropogenic ECVs (GHG emissions and Water Use) have been removed.

4. Adding :

- There are **22 “new” ECVs** which are the result of the merging/regrouping mentioned before.
- Besides, some ECV quantities have been added for completeness, consistency. It remains to be double checked that there is sufficient observational capacity underpinning them.



5. Changes in terminology :

- For **consistency**, **clarity of communication** and **policy relevance**

Eg. Atmosphere, ocean, terrestrial preferred to air-sea-land; Ocean acidification instead of Inorganic carbon; no acronyms.

Categories of changes: REMAIN AS IS

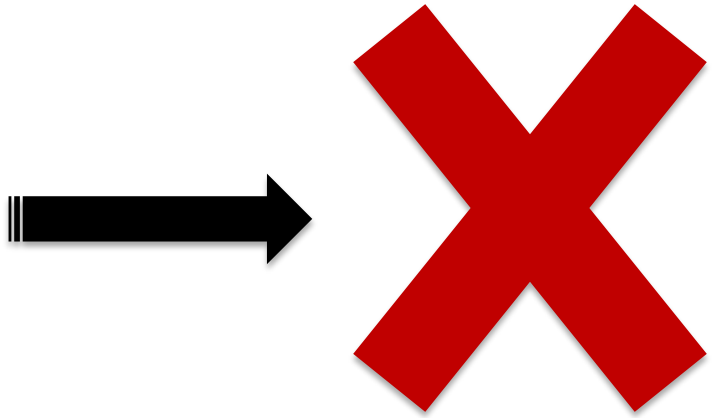
Earth Radiation Budget	35	Solar spectral irradiance
	36	Downward short-wave irradiance at top of the atmosphere
	37	Upward long-wave irradiance at top of the atmosphere
	38	Upward short-wave irradiance at top of the atmosphere
***Ocean* Nutrients**	29	Silicate concentration
	30	Phosphate concentration
	31	Nitrate concentration
Glaciers	19	Glacier Area
	20	Glacier Elevation Change
	21	Glacier Mass Change

Categories of changes: ELIMINATE

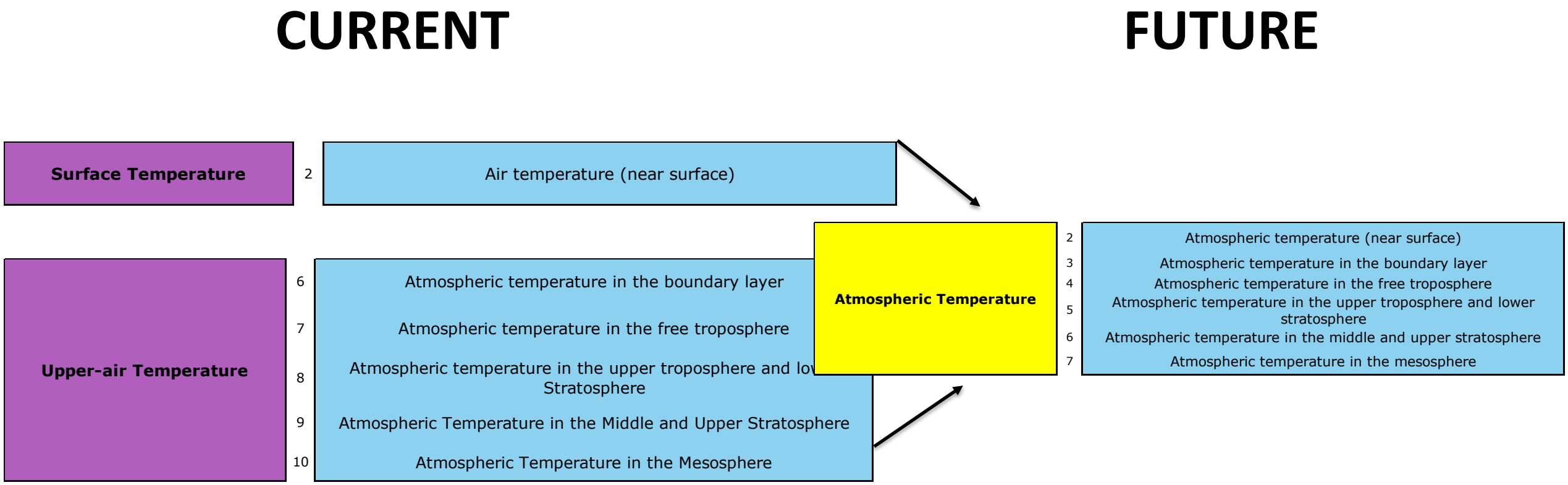
CURRENT

Anthropogenic Water Use	57	~~Anthropogenic Water Use~~
Anthropogenic Greenhouse-Gas Fluxes	44	~~Anthropogenic CO2 Emissions from Fossil Fuel Use, Industry, Agriculture, Waste and Products Use~~
	45	~~Anthropogenic CH4 Emissions from Fossil Fuel, Waste, Agriculture, Industrial Processes and Fuel Use~~
	46	~~Anthropogenic N2O Emissions from Fossil Fuel Use, Industry, Agriculture, Waste and Products Use, Indirect from N-Related Emissions/Depositions~~
	47	~~Anthropogenic F-Gas Emissions from Industrial Processes and Product Use~~
	48	~~Total Estimated Fluxes by Coupled Data Assimilation/Models with Observed Atmospheric Composition – National~~
	49	~~Total Estimated Fluxes by Coupled Data Assimilation/Models with Observed Atmospheric Composition - Continental~~
	50	~~Anthropogenic CO2 Emissions/Removals by Land Categories~~
	51	~~High-Resolution Footprint Around Point Sources~~

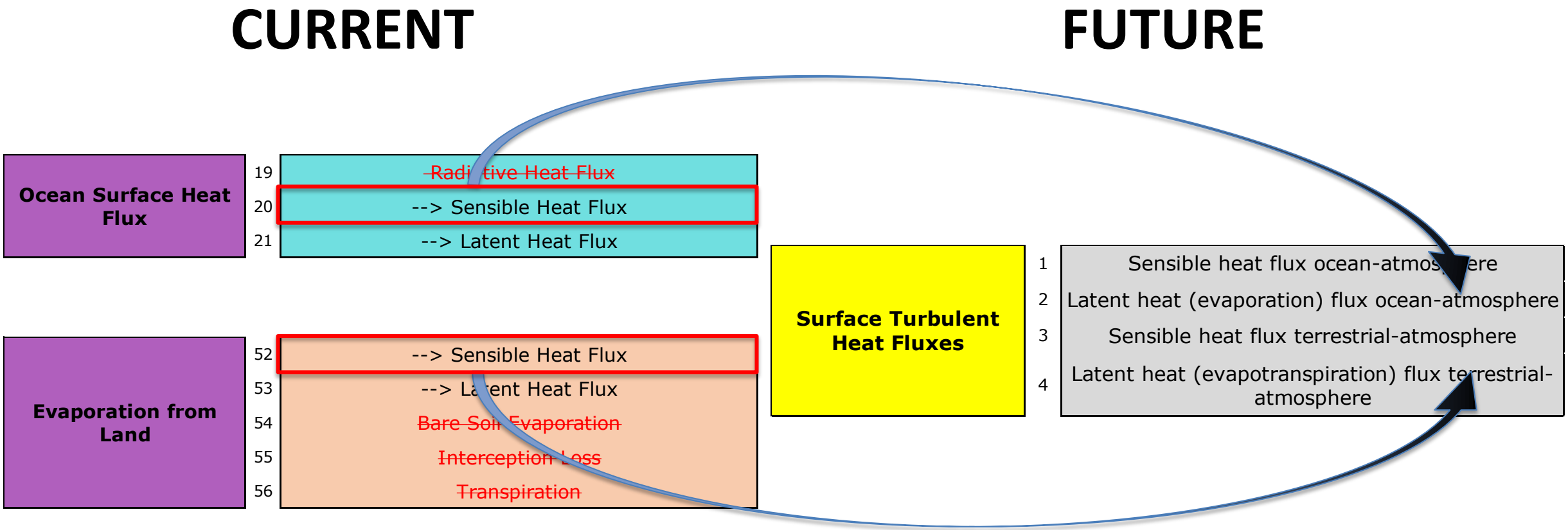
FUTURE



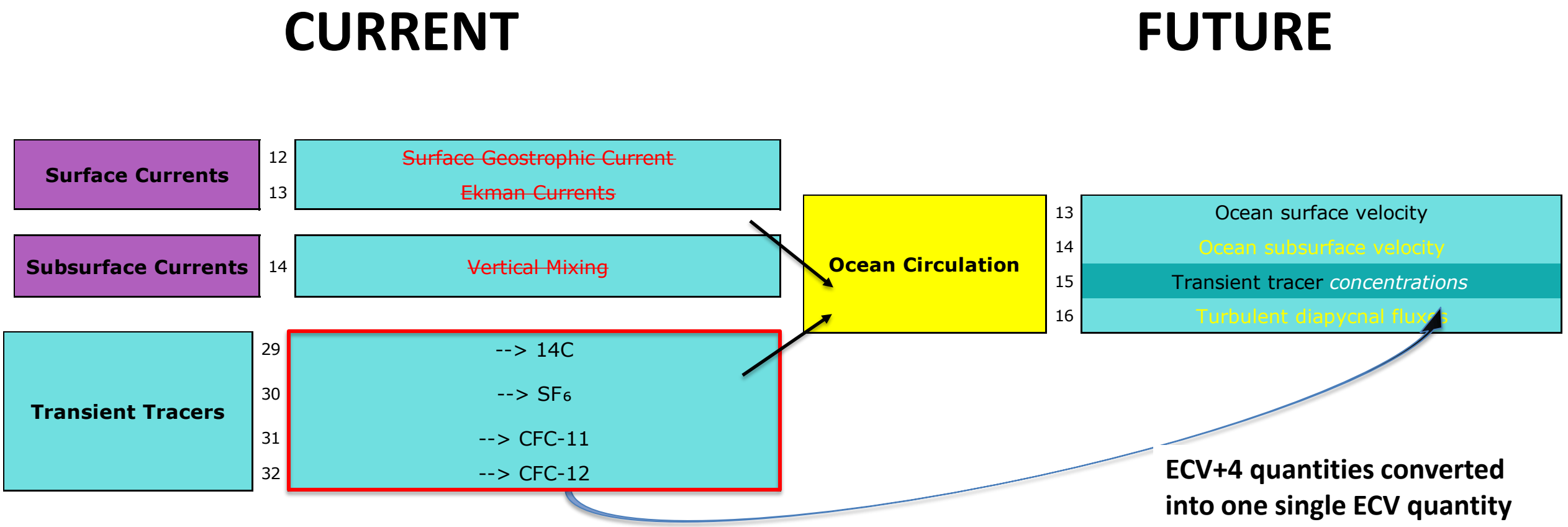
Categories of changes: COMBINE + ADD



Categories of changes: MOVE - ECV quantity relocated



Categories of changes: COMBINE + MOVE



ECV

AOPC | OOPC | TOPC

ECV quantities

AOPC | OOPC | TOPC

Categories of changes: *TERMINOLOGY*

Consistency
Comprehension
Clarity

Cloud ~~*Properties*~~

Atmospheric *Surface* Pressure

***Ocean* Nutrients**

Blue carbon habitats (mangroves, seagrass, saltmarshes, macroalgae)

Ocean surface *wind* stress *vector*

Lake Water Level ~~*(LWL)*~~

Seasonal freeze/thaw

Peatland *volume*

COMPARISON ORIGINAL – NEW - AOPC OOPC TOPC

CURRENT

ECV	#	Variable
Air Pressure	1	Atmospheric pressure (near surface)
Surface Temperature	2	Air temperature (near surface)
Surface wind Speed and Direction	3	Wind speed (near surface)
	4	Wind direction (near surface)
	5	Wind vector (near surface)
Upper-air Temperature	6	Atmospheric temperature in the boundary layer
	7	Atmospheric temperature in the free troposphere
	8	Atmospheric temperature in the upper troposphere and lower Stratosphere
	9	Atmospheric Temperature in the Middle and Upper Stratosphere
	10	Atmospheric Temperature in the Mesosphere
Upper-air Wind Speed and Direction	11	Wind (horizontal) in the Boundary Layer
	12	Wind (horizontal) in the Free Troposphere
	13	Wind (horizontal) in the Upper Troposphere and Lower Stratosphere
	14	Wind (horizontal) in the Middle and Upper Stratosphere
	15	~~Wind (horizontal) in the Mesosphere~~
	16	Wind (vertical) in the Boundary Layer
	17	Wind (vertical) in the Free Troposphere
	18	Wind (vertical) in the Upper Troposphere and Lower Stratosphere
	19	Wind (vertical) In the Middle and Upper Stratosphere
	20	~~Wind (vertical) in the Mesosphere~~
Surface Water Vapour	21	~~Dew Point Temperature (near surface)~~
	22	Relative Humidity (near surface)
	23	Air Specific Humidity (near surface)
Upper-air Water Vapour	24	~~Water Vapour Mixing Ratio in the Upper Troposphere and Lower Stratosphere~~
	25	~~Water Vapour Mixing Ratio in the Middle and Upper Stratosphere~~
	26	~~Water Vapour Mixing Ratio in the Mesosphere~~
	27	Relative Humidity in the Boundary Layer
	28	Relative Humidity in the Free Troposphere
	29	Relative Humidity in the Upper Troposphere and Lower Stratosphere
	30	Specific Humidity in the Boundary Layer
	31	Specific Humidity in the Free Troposphere
	32	Integrated Water Vapour
Precipitation	33	Accumulated precipitation
Surface Radiation Budget	34	Downward Short-Wave Irradiance at Earth Surface
	35	Downward Long-Wave Irradiance at Earth Surface
	36	Upward Long-Wave Irradiance at Earth Surface
Earth Radiation Budget	37	Solar Spectral Irradiance
	38	Downward Short-Wave Irradiance at Top of the Atmosphere
	39	Upward Long-Wave Irradiance at Top of the Atmosphere
	40	Upward Short-Wave Irradiance at Top of the Atmosphere
	41	Radiation Profile
Cloud ~~Properties~~	42	Cloud Cover
	43	Cloud Liquid Water Path
	44	Cloud Ice Water Path
	45	Cloud Drop Effective Radius
	46	Cloud Optical Depth
	47	Cloud Top Temperature
	48	Cloud Top Height
Lightning	49	Total Lightning Stroke Density
	50	Schumann Resonances
Carbon Dioxide, Methane and Other Greenhouse Gases	51	CO2 Mole Fraction
	52	CO2 Column Average Dry Air Mixing Ratio
	53	CH4 Mole Fraction
	54	CH4 Column Average Dry Air Mixing Ratio
	55, 56	N2O Mole Fraction
Ozone	57	Ozone Mole Fraction in the Troposphere
	58	Ozone Mole Fraction in the Upper Troposphere/ Lower Stratosphere
	59	Ozone Mole Fraction in the Middle and Upper Stratosphere
	60	Ozone Total Column
	61	Ozone Tropospheric Column
	62	Ozone Stratospheric Column
Precursors (Supporting the aerosol and ozone ECVs)	63	CO Tropospheric Column
	64	CO Mole Fraction
	65	HCHO Tropospheric Column
	66	SO2 Tropospheric Column
	67	SO2 Stratospheric Column
	68	NO2 Tropospheric Column
	69	NO2 Mole Fraction
Aerosols Properties	70	Aerosol Light Extinction Vertical Profile (Troposphere)
	71	Aerosol Light Extinction Vertical Profile (Stratosphere)
	72	Multi-wavelength Aerosol Optical Depth
	73	Aerosol Single Scattering Albedo
	74	Chemical Composition of Aerosol Particles
	75	Number of Cloud Condensation Nuclei
	76	Aerosol Number Size Distribution

ECV	#	Variable
Sea-Surface temperature	1	Sea-Surface temperature
Subsurface Temperature	2	Interior Temperature
Sea-Surface Salinity	3	Sea-Surface Salinity
Subsurface Salinity	4	Interior Salinity
Sea Ice	5	Sea Ice Concentration
	6	Sea Ice Thickness
	7	Sea Ice Drift
	8	Sea Ice Age
	9	Sea Ice Surface Temperature ~~(IST)~~
	10	--> Sea ice Surface Albedo
	11	Snow Depth on Sea Ice
Surface Currents	12	~~Surface Geostrophic Current~~
	13	~~Ekman Currents~~
Subsurface Currents	14	~~Vertical Mixing~~
Sea Level	15	~~Regional Mean Sea Level~~
	16	~~Global Mean Sea Level~~
Sea State	17	Wave Height
Surface Stress	18	Ocean surface stress
Ocean Surface Heat Flux	19	~~Radiative Heat Flux~~
	20	--> Sensible Heat Flux
	21	--> Latent Heat Flux
Oxygen	22	Dissolved Oxygen Concentration
Nutrients	23	Silicate
	24	Phosphate
	25	Nitrate
Ocean Inorganic Carbon	26	Total Alkalinity ~~(TA)~~
	27	Dissolved Inorganic Carbon ~~(DIC)~~
	28	pCO₂
Transient Tracers	29	--> 14C
	30	--> SF₆
	31	--> CFC-11
	32	--> CFC-12
Ocean nitrous oxide N2O	33	~~Interior~~ Ocean Nitrous Oxide N2O
	34	-- > N2O Air-Sea Flux
Ocean Colour	35	~~Water Leaving Radiance~~
	36	--> Chlorophyll-a concentration
Plankton	37	--> Zooplankton Diversity
	38	--> Zooplankton Biomass
	39	--> Phytoplankton Diversity
	40	--> Phytoplankton Biomass
Marine Habitat Properties	41	--> Mangrove Cover and Composition
	42	--> Seagrass Cover (areal extent)
	43	--> Macroalgal Canopy Cover and Composition
	44	--> Hard coral cover and composition

ECV	#	Variable
Groundwater	1	Groundwater Storage Change
	2	Groundwater Level
Lakes	3	Lake Water Level ~~(LWL)~~
	4	Lake Water Extent
	5	Lake Surface Water Temperature
	6	Lake Ice Cover
	7	Lake Ice Thickness
	8	Lake Water-Leaving Radiance
Rivers	9	River discharge
	10	River Water Level
Soil Moisture	11	~~Surface~~ Soil Moisture
	12	Freeze/Thaw
	13	~~Surface Inundation~~
	14	~~Root Zone Soil Moisture~~
Terrestrial Water Storage	15	Terrestrial Water Storage Anomaly
Snow	16	Snow Cover Extent
	17	Snow Depth
	18	Snow Water Equivalent
Glaciers	19	Glacier Area
	20	Glacier Elevation Change
	21	Glacier Mass Change
Ice Sheets and Ice Shelves	22	Ice Surface Elevation Change
	23	Ice Sheet and Ice Shelves Velocity
	24	Ice Volume Change
	25	Ice Grounding Line Location ~~and thickness~~
Permafrost	26	Permafrost Temperature
	27	Permafrost Active Layer Thickness
	28	Rock Glacier Velocity
Fraction of FAPAR	29	---> Fraction of Absorbed Photosynthetically Active Radiation
Leaf Area Index	30	---> Leaf Area Index (LAI)
Albedo	31	Spectral and Broadband (Visible, Near Infrared and Shortwave) DHR & BHR with Associated Spectral Bidirectional Reflectance Distribution Function (BRDF) Parameters
Land-Surface Temperature	32	Land Surface Temperature ~~(LST)~~
	33	--- > Soil temperature
Above-Ground Biomass	34	Above-Ground Biomass (AGB)
Land Cover	35	Land Cover Type
	36	~~Maps of High-Resolution Land Cover~~
	37	~~Maps of Key IPCC Land Classes, Related Changes and Land Management Types~~
Soil carbon	38	---> Carbon in Soil
	39	~~Mineral Soil Bulk Density~~
	40	---> Peatlands
Fire	41	Burned Area
	42	Active Fires
	43	Fire Radiative Power
Anthropogenic Greenhouse-Gas Fluxes	44	~~Anthropogenic CO2 Emissions from Fossil Fuel Use, Industry, Agriculture, Waste and Products Use~~
	45	~~Anthropogenic CH4 Emissions from Fossil Fuel, Waste, Agriculture, Industrial Processes and Fuel Use~~
	46	~~Anthropogenic N2O Emissions from Fossil Fuel Use, Industry, Agriculture, Waste and Products Use, Indirect from N-Related Emissions/Depositions~~
	47	~~Anthropogenic F-Gas Emissions from Industrial Processes and Product Use~~
	48	~~Total Estimated Fluxes by Coupled Data Assimilation/Models with Observed Atmospheric Composition – National~~
	49	~~Total Estimated Fluxes by Coupled Data Assimilation/Models with Observed Atmospheric Composition – Continental~~
	50	~~Anthropogenic CO2 Emissions/Removals by Land Categories~~
	51	~~High-Resolution Footprint Around Point Sources~~
Evaporation from Land	52	Sensible Heat Flux
	53	Latent Heat Flux
	54	~~Bare Soil Evaporation~~
	55	~~Interception Loss~~
	56	~~Transpiration~~
Anthropogenic Water Use	57	~~Anthropogenic Water Use~~

FUTURE

ECV	#	Variable
Atmospheric *Surface* Pressure	1	Atmospheric pressure (near surface)
Atmospheric Temperature	2	Atmospheric temperature (near surface)
	3	Atmospheric temperature in the boundary layer
	4	Atmospheric temperature in the free troposphere
	5	Atmospheric temperature in the upper troposphere and lower stratosphere
	6	Atmospheric temperature in the middle and upper stratosphere
	7	Atmospheric temperature in the mesosphere
Atmospheric Winds	8	Wind speed (near surface)
	9	Wind direction (near surface)
	10	Wind vector (near surface)
	11	Wind vector (horizontal) in the boundary layer
	12	Wind vector (horizontal) in the free troposphere
	13	Wind vector (horizontal) in the upper troposphere lower stratosphere
	14	Wind vector (horizontal) in the middle and upper stratosphere
	15	Wind (vertical) in the boundary layer
	16	Wind (vertical) in the free troposphere
	17	Wind (vertical) in the upper troposphere lower stratosphere
	18	Wind (vertical) in the middle and upper stratosphere
Atmospheric Water Vapour	19	Atmospheric relative humidity (near surface)
	20	Atmospheric specific humidity (near surface)
	21	Atmospheric wet bulb temperature (near surface)
	22	Atmospheric relative humidity in the boundary layer
	23	Atmospheric relative humidity in the free troposphere
	24	Atmospheric relative humidity in the upper troposphere and lower stratosphere
	25	Atmospheric specific humidity in the boundary layer
	26	Atmospheric specific humidity in the free troposphere
	27	Atmospheric integrated water vapour
Precipitation	28	Accumulated precipitation
	29	Precipitation type
	30	Precipation intensity
Surface Radiation Budget	31	Downward short-wave irradiance at earth surface
	32	Downward long-wave irradiance at earth surface
	33	Reflected short-wave irradiance at earth surface
	34	Upward long-wave irradiance at earth surface
Earth Radiation Budget	35	Solar spectral irradiance
	36	Downward short-wave irradiance at top of the atmosphere
	37	Upward long-wave irradiance at top of the atmosphere
	38	Upward short-wave irradiance at top of the atmosphere
Clouds	39	Cloud cover
	40	Cloud liquid water path
	41	Cloud ice water path
	42	Cloud drop effective radius
	43	Cloud ice particle effective radius
	44	Cloud optical depth
	45	Cloud top temperature
	46	Cloud top height
Lightning	47	Total lightning stroke density
	48	Lightning flash density
	49	Thunder day
	50	Schumann resonance
Ozone and its precursors	51	Ozone mole fraction in the *free* troposphere
	52	Ozone mole fraction in the upper troposphere/ lower stratosphere
	53	Ozone mole fraction in the middle and upper stratosphere
	54	Ozone total column
	55	Ozone tropospheric column
	56	Ozone stratospheric column
	57	CO tropospheric column
	58	CO mole fraction
	59	HCHO tropospheric column
	60	NO2 tropospheric column
	61	NO2 mole fraction
Aerosols and its precursors	62	Aerosol light extinction vertical profile in the troposphere
	63	Aerosol light extinction vertical profile in the stratosphere
	64	Multi-wavelength aerosol optical depth
	65	Aerosol single scattering albedo
	66	Chemical composition of aerosol particles
	67	Number of cloud condensation nuclei
	68	Aerosol number size distribution
	69	SO2 tropospheric column
	70	SO2 stratospheric column

ECV	#	Variable
Ocean Temperature	1	Sea surface temperature (skin)
	2	Sea surface temperature (bulk)
	3	Subsurface ocean temperature
Ocean Salinity	4	Sea surface salinity (skin)
	5	Sea surface salinity (bulk)
	6	Subsurface ocean salinity
Sea Ice	7	Sea ice concentration
	8	Sea ice thickness
	9	Sea ice drift *vector*
	10	Sea ice age
	11	Sea ice surface temperature
	12	Snow depth on sea ice
Ocean Circulation	13	Ocean surface velocity
	14	Ocean surface velocity
	15	Transient tracer *concentrations*
	16	Turbulent diapycnal fluxes
Sea Level	17	Absolute sea level
	18	Relative sea level
Sea State	19	Wave height
	20	Wave period
	21	Wave direction
Ocean Surface Wind Stress	22	Ocean surface *wind* stress *vector*
Ocean Acidification	23	Total alkalinity
	24	Dissolved inorganic carbon
	25	pH
	26	pCO₂
Ocean Dissolved Gases	27	Dissolved oxygen concentration
	28	*Dissolved* nitrous oxide concentration
Ocean Nutrients	29	Silicate concentration
	30	Phosphate concentration
	31	Nitrate concentration
Ocean Organic Carbon Storage	32	Dissolved organic carbon
	33	Particulate organic carbon
	34	Ocean biomass carbon storage (phytoplankton, zooplankton ...)
	35	Blue carbon habitats (mangroves, seagrass, saltmarshes, macroalgae)
Ocean Colour and Productivity	36	Chlorophyll-a concentration
	37	Gross primary productivity
	38	Net primary productivity
	39	Photosyntetically available radiation - PAR

ECV	#	Variable
Groundwater	1	Groundwater storage change
	2	Groundwater level
Lakes	3	Lake water level
	4	Lake water extent
	5	Lake surface water temperature
	6	Lake subsurface water temperature
	7	Lake ice cover
	8	Lake ice thickness
Rivers	9	River discharge
	10	River water level
Soil physics	11	*Seasonal* freeze/thaw
	12	Soil temperature
	13	Soil moisture
Terrestrial Water Storage	14	Terrestrial water storage anomaly
Snow	15	Snow cover extent
	16	Snow depth
	17	Snow water equivalent
Glaciers	18	Glacier area
	19	Glacier elevation change
	20	Glacier velocity
	21	Glacier mass change
Ice Sheets and Ice Shelves	22	*Ice* surface elevation change
	23	Ice sheet and ice shelves velocity
	24	Ice volume change
	25	*Ice* grounding line location
Permafrost	26	Permafrost temperature
	27	Permafrost active layer thickness
	28	Permafrost extent
	29	Rock glacier velocity
Land Surface Temperature	30	Land surface temperature
Land Cover and Use	31	Land cover type
	32	Land use and land management and change
Fire	33	Burned area
	34	Active fires
	35	Fire radiative power
Terrestrial carbon storage	36	Vegetation height
	37	Vegetation type and species
	38	Aboveground biomass carbon stocks
	39	Peatland *volume*
	40	Organic carbon stocks in soils
Vegetation productivity	41	Fraction of absorbed photosynthetically active radiation
	42	Gross primary productivity
	43	Net primary productivity
Vegetation phenology	44	Leaf area index
	45	Growing season characteristics

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ECV	#	Variable
Surface Turbulent Heat Fluxes	1	Sensible heat flux ocean-atmosphere
	2	Latent heat (evaporation) flux ocean-atmosphere
	3	Sensible heat flux terrestrial-atmosphere
	4	Latent heat (evapotranspiration) flux terrestrial-atmosphere
Albedo over all solid surfaces	5	Spectral and Broadband (Visible, Near Infrared and Shortwave) DHR & BHR with Associated Spectral Bidirectional Reflectance Distribution Function (BRDF) Parameters
Carbon Dioxide and other long-lived greenhouse gases	6	CO2 mole fraction
	7	CO2 column average dry air mixing ratio
	8	N2O mole fraction
	9	N2O column average dry air mixing ratio
	10	N2O atmosphere-ocean fluxes
	11	N2O atmosphere-terrestrial fluxes
	12	CO2 atmosphere-ocean fluxes
	13	CO2 atmosphere-terrestrial fluxes
Methane and other short-lived greenhouse gases	14	CH4 mole fraction
	15	CH4 column average dry air mixing ratio
	16	CH4 atmosphere-ocean fluxes
	17	CH4 atmosphere-terrestrial fluxes

OVERVIEW

CURRENT

Number ECV (Total = **55**)

AOPC =16	OOPC = 19	TOPC = 20

ECV quantities (Total = **177**)

AOPC = 76	OOPC = 44	TOPC = 57

23 out of 55 ECVs remain

FUTURE

Number ECV (Total **42**)

AOPC =11	OOPC = 12	TOPC = 15	CP = 4

ECV quantities (Total =**170**)

AOPC = 70	OOPC = 39	TOPC = 45	CP = 16

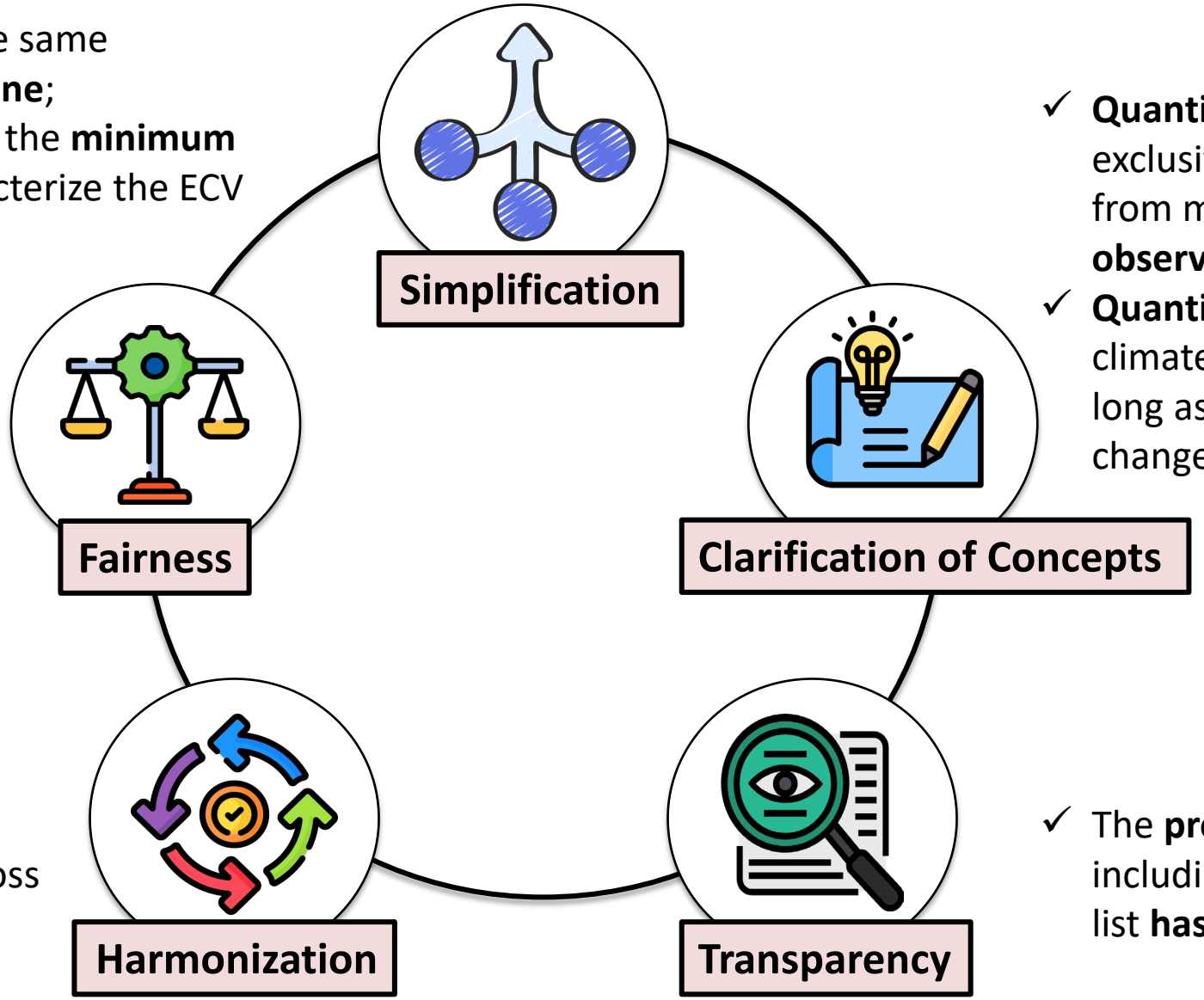
All new ECVs are the result of combining/moving previous ECVs

What has been achieved

- ✓ **Variables** that refer to the same property **should be just one**;
- ✓ **ECV quantities** should be the **minimum number** needed to characterize the ECV

- ✓ The **current grouping** is **more balanced** in terms of weight given to the ECVs and ECV quantities

- ✓ The terminology is more **consistent** across panels



- ✓ **Quantities** cannot be based exclusively in statistics/derived from models, they **must be observed**;
- ✓ **Quantities** that **show impact** (of climate change) **can be ECVs**, as long as they inform on climate change

- ✓ The **process** that leads to including a new variable in the list **has been defined**

Next steps

Time	Activity	Responsible
Q3 2024	Consultation of ECV/ECV quantities list v.1 with GCOS panels	GCOS officers
Q3 2024	Preparation of materials to be used during the consultation with key stakeholders	TT chair and Secretariat
MILESTONE Sep 2024	• ECV/ECV quantities list v.2 • Materials for consultation process finalised • Final list of key stakeholders	TT
Q4 2024	10-15 structured interviews with stakeholders	TT chair and Secretariat and TT members
Q1 2025	Analysis of the results from the i… …eparation of material for public review	TT chair, Secretariat and TT members
MILESTONE March 2025	• ECV/ECV … • …ublic review, including PPT to inform in Conferences …ised	TT (online meeting)
Q2 2025	Public Review	GCOS Secretariat
Q3 2025	Analysis of the results from the public review	TT chair, Secretariat and TT members
MILESTONE End of 2025	• ECV/ECV quantities list v.4 • Draft 0 of an ECV paper describing the process and introducing the new ECVs and procedures	TT **(final in person meeting)**

NOTHING IS FINAL UNTIL EVERYTHING IS FINAL!

Thank you!

GLOBAL CLIMATE OBSERVING SYSTEM

KEEPING WATCH OVER OUR CLIMATE

WMO

unesco Intergovernmental Oceanographic Commission

International Science Council

UN environment programme

Supported by the European Union

opernicus Europe's eyes on Earth