

CURRENT ECV LIST

ECV (GCOS-245, 2022)
ECV Quantity (GCOS-245, 2022)

Air Pressure
Atmospheric pressure (near surface)

Surface Temperature
Air Atmospheric temperature (near surface)
Upper-air Temperature
Atmospheric temperature in the boundary layer
Atmospheric temperature in the free troposphere
Atmospheric temperature in the upper troposphere and lower stratosphere
Atmospheric Temperature in the Middle and Upper Stratosphere
Atmospheric Temperature in the Mesosphere

Surface Wind Speed and Direction
Wind speed (near surface)
Wind direction (near surface)
Wind vector (near surface)
Upper-air Wind Speed and Direction
Wind (horizontal) in the Boundary Layer
Wind (horizontal) in the Free Troposphere
Wind (horizontal) in the Upper Troposphere and Lower Stratosphere
Wind (horizontal) in the Middle and Upper Stratosphere
Wind (horizontal) in the Mesosphere
Wind (vertical) in the Boundary Layer
Wind (vertical) in the Free Troposphere
Wind (vertical) in the Upper Troposphere and Lower Stratosphere
Wind (vertical) In the Middle and Upper Stratosphere
Wind (vertical) in the Mesosphere

Surface Water Vapour
Dew Point Temperature (near surface)
Relative Humidity (near surface)
Air Specific Humidity (near surface)
Upper-air Water Vapour
Water Vapour Mixing Ratio in the Upper Troposphere and Lower Stratosphere
Water Vapour Mixing Ratio in the Middle and Upper Stratosphere
Water Vapour Mixing Ratio in the Mesosphere
Relative Humidity in the Boundary Layer
Relative Humidity in the Free Troposphere
Relative Humidity in the Upper Troposphere and Lower Stratosphere
Specific Humidity in the Boundary Layer
Specific Humidity in the Free Troposphere
Integrated Water Vapour

Precipitation
Accumulated precipitation

PROPOSED ECV LIST

Proposed Overarching ECV (2025)
Proposed ECV Quantity(ies) (2025)

Atmospheric Surface Pressure
Atmospheric pressure (near surface)

Atmospheric Temperature
Atmospheric temperature (near surface)
Atmospheric temperature in the boundary layer
Atmospheric temperature in the free troposphere
Atmospheric temperature in the upper troposphere and lower stratosphere
Atmospheric temperature in the middle and upper stratosphere
Atmospheric temperature in the mesosphere

Atmospheric Winds
Wind speed (near surface)
Wind direction (near surface)
Wind vector (near surface)
Wind vector (horizontal) in the boundary layer
Wind vector (horizontal) in the free troposphere
Wind vector (horizontal) in the upper troposphere and lower stratosphere
Wind vector (horizontal) in the middle and upper stratosphere
Wind (vertical) in the boundary layer
Wind (vertical) in the free troposphere
Wind (vertical) in the upper troposphere and lower stratosphere
Wind (vertical) in the middle and upper stratosphere

Atmospheric Water Vapour
Atmospheric relative humidity (near surface)
Atmospheric specific humidity (near surface)
Atmospheric wet bulb temperature (near surface)
Atmospheric relative humidity in the boundary layer
Atmospheric relative humidity in the free troposphere
Atmospheric relative humidity in the upper troposphere and lower stratosphere
Atmospheric specific humidity in the boundary layer
Atmospheric specific humidity in the free troposphere
Atmospheric integrated water vapour

Precipitation
Accumulated precipitation
Precipitation type
Precipitation intensity

Surface Radiation Budget
Downward Short-Wave Irradiance at Earth Surface
Downward Long-Wave Irradiance at Earth Surface
Upward Long-Wave Irradiance at Earth Surface

Surface Radiation Budget
Downward short-wave irradiance at earth surface
Downward long-wave irradiance at earth surface
Reflected short-wave irradiance at earth surface
Upward long-wave irradiance at earth surface

Earth Radiation Budget
Solar Spectral Irradiance
Downward Short-Wave Irradiance at Top of the Atmosphere
Upward Long-Wave Irradiance at Top of the Atmosphere
Upward Short-Wave Irradiance at Top of the Atmosphere
Radiation Profile

Earth Radiation Budget
Solar spectral irradiance
Downward short-wave irradiance at top of the atmosphere
Upward long-wave irradiance at top of the atmosphere
Upward short-wave irradiance at top of the atmosphere

Cloud Properties
Cloud Cover
Cloud Liquid Water Path
Cloud Ice Water Path
Cloud Drop Effective Radius
Cloud Optical Depth
Cloud Top Temperature
Cloud Top Height

Clouds
Cloud cover
Cloud liquid water path
Cloud ice water path
Cloud droplet effective radius
Cloud ice particle effective radius
Cloud optical depth
Cloud top temperature
Cloud top height

Lightning
Total Lightning Stroke Density
Schumann Resonances

Lightning
Total lightning stroke density
Lightning flash density
Thunder day
Schumann resonance

Ozone
Ozone Mole Fraction in the Troposphere
Ozone Mole Fraction in the Upper Troposphere/ Lower Stratosphere
Ozone Mole Fraction in the Middle and Upper Stratosphere
Ozone Total Column
Ozone Tropospheric Column
Ozone Stratospheric Column

Ozone and its Precursors
Ozone mole fraction in the free troposphere
Ozone mole fraction in the upper troposphere and lower stratosphere
Ozone mole fraction in the middle and upper stratosphere
Ozone total column
Ozone tropospheric column
Ozone stratospheric column
CO tropospheric column
CO mole fraction
HCHO tropospheric column
NO2 tropospheric column
NO2 mole fraction

Precursors (Supporting the aerosol and ozone ECVs)
CO Tropospheric Column
CO Mole Fraction
HCHO Tropospheric Column
SO2 Tropospheric Column
SO2 Stratospheric Column
NO2 Tropospheric Column
NO2 Mole Fraction

Aerosols and its precursors
Aerosol light extinction vertical profile in the troposphere
Aerosol light extinction vertical profile in the stratosphere
Multi-wavelength aerosol optical depth
Aerosol single scattering albedo
Chemical composition of aerosol particles
Number of cloud condensation nuclei
Aerosol number size distribution
SO2 tropospheric column
SO2 stratospheric column

Aerosols Properties
Aerosol Light Extinction Vertical Profile (Troposphere)
Aerosol Light Extinction Vertical Profile (Stratosphere)
Multi-wavelength Aerosol Optical Depth
Aerosol Single Scattering Albedo
Chemical Composition of Aerosol Particles
Number of Cloud Condensation Nuclei
Aerosol Number Size Distribution

Carbon Dioxide, Methane and Other Greenhouse Gases

CO2 Mole Fraction

CO2 Column Average Dry Air Mixing Ratio

CH4 Mole Fraction

CH4 Column Average Dry Air Mixing Ratio

N2O Mole Fraction

CURRENT ECV LIST

ECV (GCOS-245, 2022)
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Sea-Surface temperature
Sea-Surface temperature

Subsurface Temperature
Interior Subsurface Temperature

Sea-Surface Salinity
Sea-Surface Salinity

Subsurface Salinity
Interior Subsurface Salinity

Sea Ice
Sea Ice Concentration
Sea Ice Thickness
Sea Ice Drift
Sea Ice Age
Sea Ice Surface Temperature (IST)
Sea ice Surface Albedo
Snow Depth on Sea Ice

Surface Currents
Surface Geostrophic Current
Ekman Currents
Subsurface Currents
Vertical Mixing
Transient Tracers
14C
SF ₆
CFC-11
CFC-12

Sea Level
Regional Mean Sea Level
Global Mean Sea Level

Sea State
Wave Height

Surface Stress
Ocean surface stress

PROPOSED ECV LIST

Proposed Overarching ECV (2025)
Proposed ECV Quantity(ies) (2025)

Ocean Temperature
Sea surface temperature (skin)
Sea surface temperature (bulk)
Subsurface ocean temperature

Ocean Salinity
Sea surface salinity (subskin)
Sea surface salinity (bulk)
Subsurface ocean salinity

Sea Ice
Sea ice concentration
Sea ice thickness
Sea ice drift vector
Sea ice age
Sea ice surface temperature
Snow depth on sea ice

Ocean Circulation
Ocean surface velocity
Ocean subsurface velocity
Transient tracer concentrations
Turbulent diapycnal fluxes

Sea Level
Absolute sea level
Relative sea level

Sea State
Wave height
Wave period
Wave direction

Ocean Surface Wind Stress
Ocean surface wind stress vector

Ocean Inorganic Carbon
Total Alkalinity (TA)
Dissolved Inorganic Carbon (DIC)
pCO ₂
Oxygen
Dissolved Oxygen Concentration
Ocean Nitrous Oxide N ₂ O
Interior Ocean Nitrous Oxide N ₂ O
N ₂ O Air-Sea Flux

Ocean Acidification and Other Greenhouse Gases
Total alkalinity
Dissolved inorganic carbon
pH
pCO ₂
Dissolved nitrous oxide concentration

Deoxygenation
Dissolved oxygen concentration

Nutrients
Silicate
Phosphate
Nitrate

Ocean Nutrients
Silicate concentration
Phosphate concentration
Nitrate concentration

Plankton
Zooplankton Diversity
Zooplankton Biomass
Phytoplankton Diversity
Phytoplankton Biomass

Ocean Organic Carbon Storage
Dissolved organic carbon
Particulate organic carbon
Phytoplankton biomass and diversity
Zooplankton biomass and diversity
Mangroves cover and composition
Macroalgal Canopy Cover and Composition
Seagrass cover (areal extent)
Saltmarshes cover

Marine Habitat Properties
Mangrove Cover and Composition
Seagrass Cover (areal extent)
Macroalgal Canopy Cover and Composition
Hard coral cover and composition

Ocean Colour
Water Leaving Radiance
Chlorophyll-a concentration

Ocean colour and Productivity
Chlorophyll-a concentration
Gross primary productivity
Net primary productivity
Photosynthetically active radiation

Ocean Surface Heat Flux
Radiative Heat Flux
Sensible Heat Flux
Latent Heat Flux

CURRENT ECV LIST

ECV (GCOS-245, 2022)
ECV Quantity (GCOS-245, 2022)

Groundwater
Groundwater storage change
Groundwater level

Lakes
Lake Water Level (LWL)
Lake Water Extent
Lake Surface Water Temperature
Lake Ice Cover
Lake Ice Thickness
Lake Water-Leaving Reflectance

Rivers
River discharge
River water level

Soil Moisture
Surface Soil Moisture
Freeze/Thaw
Surface Inundation
Root Zone Soil Moisture

Terrestrial Water Storage
Terrestrial water storage anomaly

Snow
Snow Cover Extent
Snow Depth
Snow Water Equivalent

Glaciers
Glacier Area
Glacier Elevation Change
Glacier Mass Change

Ice Sheets and Ice Shelves
Ice Surface Elevation Change
Ice Sheet and Ice Shelves Velocity
Ice Volume Change
Ice Grounding Line Location and thickness

Permafrost
Permafrost Temperature
Permafrost Active Layer Thickness
Rock Glacier Velocity

Land Surface Temperature
Land Surface Temperature (LST)

PROPOSED ECV LIST

Proposed Overarching ECV (2025)
Proposed ECV Quantity(ies) (2025)

Groundwater
Groundwater storage change
Groundwater level

Lakes
Lake water level
Lake water extent
Lake surface water temperature
Lake subsurface water temperature
Lake ice cover
Lake ice thickness

Rivers
River discharge
River water level

Soil Physics
Seasonal freeze/thaw
Soil temperature
Soil moisture

Terrestrial Water Storage
Terrestrial water storage anomaly

Snow
Area covered by snow
Snow depth
Snow water equivalent

Glaciers
Glacier area
Glacier elevation change
Glacier surface velocity
Glacier mass change

Ice Sheets and Ice Shelves
Ice surface elevation change
Ice sheet and ice shelves velocity
Ice volume change
Ice grounding line location

Permafrost
Permafrost temperature
Permafrost active layer thickness
Permafrost extent
Rock glacier velocity

Land Surface Temperature

Soil temperature

Land Cover
Land Cover Type
Maps of High-Resolution Land Cover
Maps of Key IPCC Land Classes, Related Changes and Land Management Types

Soil carbon
Carbon in Soil
Mineral Soil Bulk Density
Peatlands volume

Fire
Burned Area
Active Fires
Fire Radiative Power

Fraction of FAPAR
Fraction of Absorbed Photosynthetically Active Radiation

Leaf Area Index
Leaf Area Index (LAI)

Albedo
Spectral and Broadband (Visible, Near Infrared and Shortwave) DHR & BHR with Associated Spectral Bidirectional Reflectance Distribution Function (BRDF) Parameters

Evaporation from Land
Sensible Heat Flux
Latent Heat Flux
Bare Soil Evaporation
Interception Loss
Transpiration

Anthropogenic Water Use
Anthropogenic Water Use

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

Land surface temperature

Land Cover and Use
Land cover type
Land use and land use change

Terrestrial Carbon Storage
Aboveground biomass carbon stocks
Peatland volume
Organic carbon stocks in soils

Fire
Burned area
Active fires
Fire radiative power
Combustion completeness
Fuel moisture content

Vegetation Properties and Productivity
Fraction of absorbed photosynthetically active radiation
Gross Primary Productivity
Leaf area index
Growing season (start and end)
Vegetation height
Vegetation type and species

CURRENT ECV LIST

ECV Quantities (GCOS-245, 2022)

Sensible Heat Flux
Latent Heat Flux
Sensible Heat Flux
Latent Heat Flux
Transpiration

Spectral and Broadband (Visible, Near Infrared and Shortwave) DHR & BHR with Associated Spectral Bidirectional Reflectance Distribution Function (BRDF) Parameters
Lake Water-Leaving Reflectance
Water Leaving Radiance
Sea ice Surface Albedo

CO2 Mole Fraction
CO2 Column Average Dry Air Mixing Ratio
N2O Mole Fraction

N2O Air-Sea Flux

CH4 Mole Fraction
CH4 Column Average Dry Air Mixing Ratio

Air Atmospheric temperature (near surface)
Sea-Surface temperature
Sea Ice Surface Temperature (IST)
Lake Surface Water Temperature
Land Surface Temperature (LST)

PROPOSED ECV LIST

Proposed Overarching ECV (2025)
Proposed ECV Quantity(ies) (2025)

Surface Turbulent Heat Fluxes
Sensible heat flux ocean-atmosphere
Latent heat (evaporation) flux ocean-atmosphere
Sensible heat flux land-atmosphere
Latent heat (evapotranspiration) flux land-atmosphere

Albedo and Reflectance Over All Surfaces
Spectral and Broadband (Visible, Near Infrared and Shortwave) DHR & BHR with Associated Spectral Bidirectional Reflectance Distribution Function (BRDF) Parameters
Lake water leaving reflectance
Ocean leaving reflectance
Albedo on sea ice

Carbon Dioxide and Other Long-lived Greenhouse Gases
CO2 mole fraction
CO2 column average dry air mixing ratio
N2O mole fraction
N2O column average dry air mixing ratio
N2O atmosphere-ocean fluxes
N2O atmosphere-land fluxes
CO2 atmosphere-ocean fluxes
CO2 atmosphere-land fluxes

Methane and Other Short-lived Greenhouse Gases
CH4 mole fraction
CH4 column average dry air mixing ratio
CH4 atmosphere-land fluxes

Temperatures at or Near the Surface
Atmospheric temperature (near surface)
Lake surface water temperature
Land surface temperature
Sea surface temperature (skin)
Sea surface temperature (bulk)
Sea ice surface temperature