

Upper-air Water Vapour

ESSENTIAL CLIMATE VARIABLE (ECV) FACTSHEET



**GLOBAL CLIMATE
OBSERVING SYSTEM**
KEEPING WATCH OVER OUR CLIMATE



ECV IN BRIEF

Domain: Atmosphere
Subdomain: Upper Atmosphere
Scientific Area: Hydrosphere
ECV Stewards: Dale Hurst, Imke Durre
Products: Total column water vapour,
 Tropospheric profiles of water vapour,
 Lower-stratospheric profiles of water vapour,
 Upper tropospheric humidity



Upper-air Water Vapour

Water vapour is the predominant gaseous source of infrared opacity in the atmosphere, accounting for about 60% of the natural greenhouse effect for clear skies. Water vapour condenses to produce clouds, changing radiative properties and releasing latent heat that drives or modifies atmospheric circulation systems. Water vapour in the lower stratosphere, though present only in small amounts, is radiatively significant. Consequently, there is potential for additional climate change feedbacks through perturbations of the processes that control the amount of water vapour in the stratosphere, such as the Brewer-Dobson circulation that strongly influences tropical tropopause temperatures and the amount of CH₄ oxidized in the stratosphere.

ECV Product¹

PRODUCT	DEFINITION	REQUIREMENTS				
		FREQ.	RES.	REQUIRED MEASUREMENT UNCERTAINTY	STABILITY	STANDARDS/ REFERENCES
Total column water vapour	Total mass of water vapour present in a vertical atmospheric column (kg/m²)	4hr	25km/NA	2%	0.30%	

¹ Current Products and Requirements as in the Implementation Plan 2016 (GCOS-200). GCOS is reviewing and will update the requirements until 2022. More information on: gcos.wmo.int and climatedata.wmo.int.



Tropospheric profiles of water vapour	3D field of the relative humidity in the troposphere. Relative humidity is the ratio of the amount of atmospheric moisture present relative to the amount that would be present if the air were saturated with respect to water or ice to be specified in the metadata (%)	4hr (troposphere)	25km/2km	5%	0.30%	
Lower-stratospheric profiles of water vapour	3D field of the relative humidity in the Lower stratosphere (%)	daily (stratosphere)	100-200km/2km	5%	0.30%	
Upper tropospheric humidity	3D field of the relative humidity in the upper troposphere (%)	1hr	25km/NA	5%	0.30%	

Data Sources²

In Situ Data:

- ▶ NOAA Earth System Research Laboratory Global Monitoring Data
<https://www.esrl.noaa.gov/gmd/>
- ▶ Network for the Detection of Atmospheric Composition Change (NDACC)
<http://www.ndsc.ncep.noaa.gov/>
- ▶ Integrated Global Radiosonde Archive (IGRA)
<https://www.ncdc.noaa.gov/data-access/weather-balloon/integrated-global-radiosonde-archive>
- ▶ GCOS Reference Upper-Air Network (GRUAN)
<https://www.gruan.org/>
- ▶ GEWEX Water Vapour Assessment
<http://gewex-vap.org/>

Reanalysis:

- ▶ REANALYSES.ORG (Inventory for Reanalysis)
<http://reanalyses.org>

Satellite:

- ▶ Satellite ECV Inventory by the CEOS/CGMS Working Group on Climate (WGClimate)
<http://climatemonitoring.info/ecvinventory>
- ▶ Aura Microwave Limb Sounder (MLS)
https://disc.gsfc.nasa.gov/datasets?page=1&keywords=ML2H2O_00

² This list provides sources for openly accessible data sets with worldwide coverage for which metadata is available. It is curated by the respective GCOS ECV Steward(s). The list does not claim to be complete. Anyone with a suitable dataset who would like it to be added to this list should contact GCOS.

