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*C3S data: Observations and Essential
Climate Variables (ECVs)*

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Climate Change

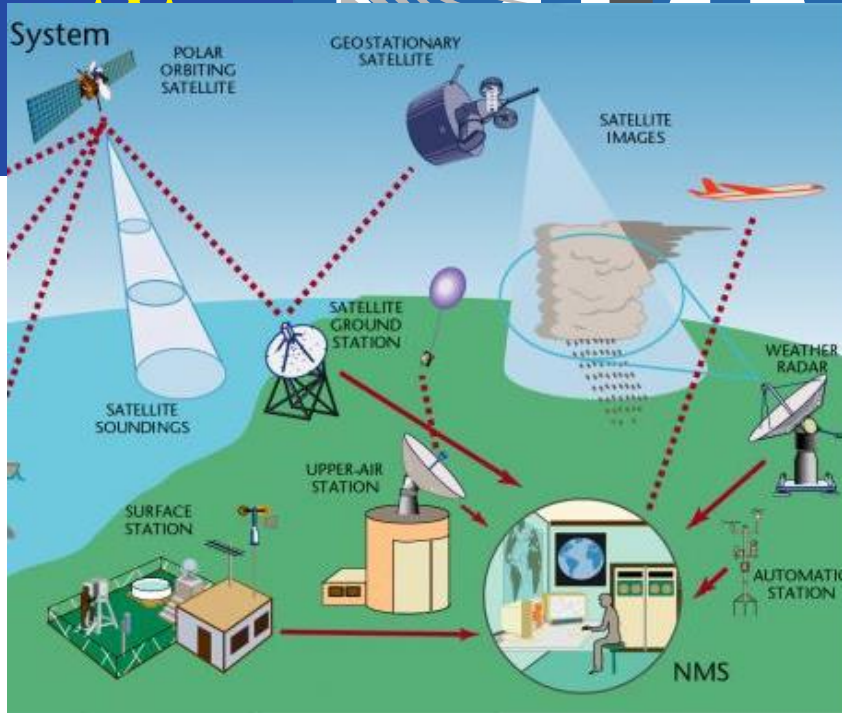


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Europe's eyes on Earth

Why observations?

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- Source WMO -

Observations are key to understand the climate system (historical & present)

Uses:

- Reanalysis (see next presentation by H. Hersbach),
- Essential Climate Variables



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ECVS

We use historical observations from in-situ and satellite sensors to build Climate Data Records of Essential Climate Variables (ECVs)

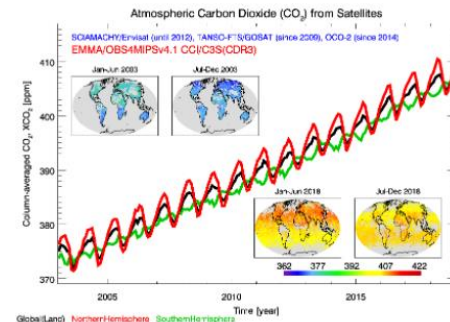
Climate Data Record: A (Thematic) Climate Data Record is a time series of measurements of sufficient length, consistency, and continuity to determine climate variability and change.

Essential Climate Variables: An Essential Climate Variable is a geophysical variable (or a group of linked variables) that critically contributes to the characterization of Earth's climate.

→ Relevant, Feasible, Cost-effective

Required to support the work of the UNFCCC and the IPCC

- Provide empirical evidence to understand the evolution of climate (climate indicators)
- Guide mitigation and adaptation measures (decision making)
- Assess risks and enable attribution of climate events to underlying causes
- Underpin climate services.

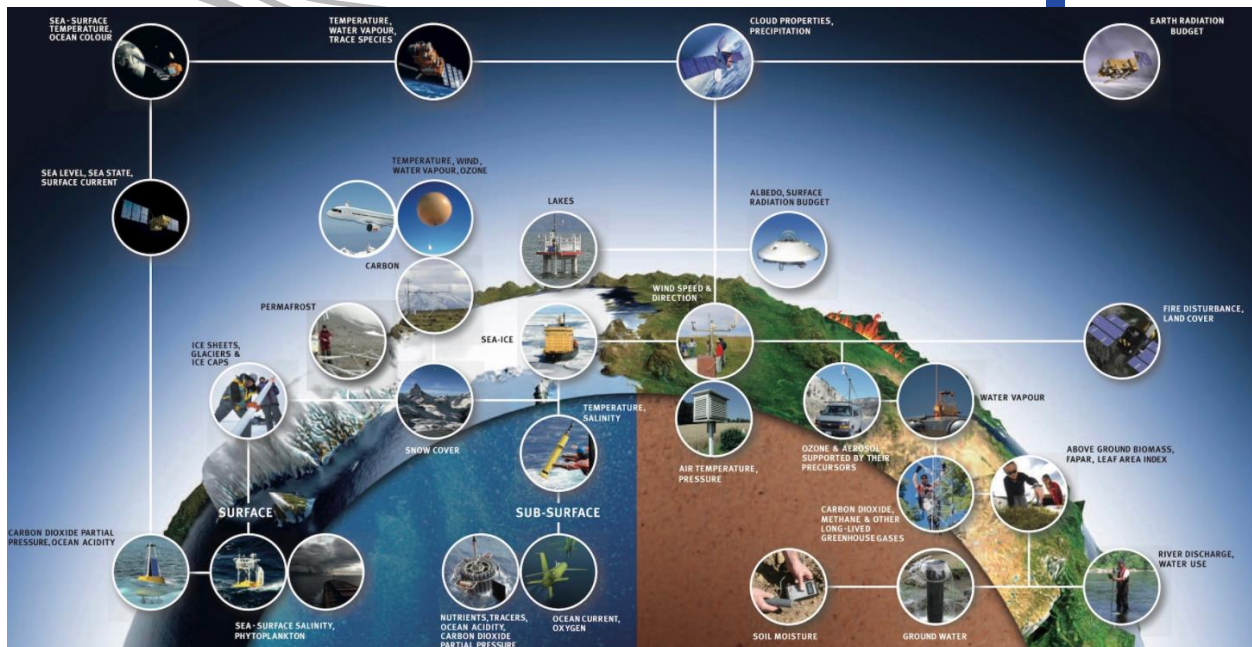




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GCOS and ECVs

Scientific requirements for observations are based on the framework provided by the [Global Climate Observing System](#) (GCOS).



→ 54 Essential Climate Variables



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ECV services in C3S (satellite data)

		C3S_312a	C3S_312b				C3S2_312		
	GCOS	2017	2018	2019	2020	2021	2022	2023	2024
Atmospheric physics									
Precipitation	4.3.5								
Surface Radiation Budget	4.3.6								
Water Vapour	4.5.3								
Cloud Properties	4.5.4								
Earth Radiation Budget	4.5.5								
Atmospheric composition									
Carbon Dioxide	4.7.1	Lot 6							
Methane	4.7.2	Lot 6							
Ozone	4.7.4	Lot 4							
Aerosol	4.7.5	Lot 5							
Ocean									
Sea Surface Temperature	5.3.1	Lot 3							
Sea Level	5.3.3	Lot 2							
Sea ice	5.3.5	Lot 1							
Ocean Colour	5.3.7								
Land hydrology & cryosphere									
Lakes	6.3.4								
Glaciers	6.3.6	Lot 8							
Ice sheets and ice shelves	6.3.7								
Soil moisture	6.3.16	Lot 7							
Land biosphere									
Albedo	6.3.9	Lot 9							
Land Cover	6.3.10								
Fraction of Absorbed Photosynthesis	6.3.11	Lot 9							
Leaf Area Index	6.3.12	Lot 9							
Fire	6.3.15								
		2019	2018	2019	2020	2021	2022	2023	2024

Table 1: From proof-of-concept phase (9 Lots) to operations (5 Lots) of C3S ECV services. The column labelled GCOS shows the relevant section in the GCOS Status Report (GCOS-SR 2015).

Coordination with CM-SAF / ROM SAF / ESA CCI / Uni. Maryland / NASA / NOAA

Coordination with ESA-CCI and other national projects

Coordination with ESA-CCI

Coordination with ESA-CCI, GloboLakes, Arc-Lake, HydroWeb

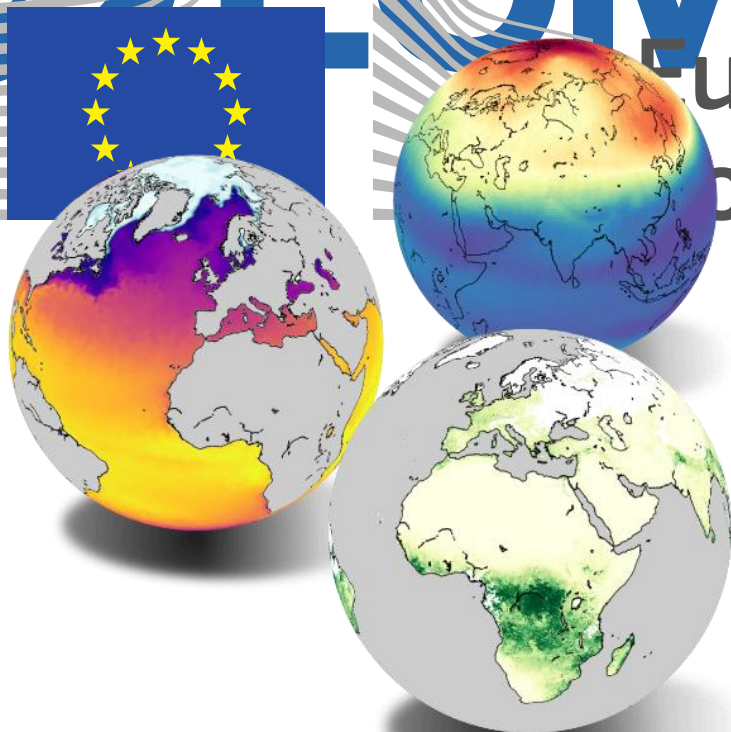
Coordination with ESA-CCI, CGL, QA4ECV, LSA-SAF





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ECVs operational services



ECV products that are

- State-of-the-art
 - **Coordination with ESA CCI, EUMETSAT/SAFs & other Copernicus services**
- Long-term, consistent, complete (CDR)
 - **Single/Multi sensor approach**
- Regularly extended in time (ICDR)
 - **Frequent updates of data records**
- Gridded, aggregated
 - **Meeting user requirements**
- Accessible & Tracible
 - Access through the Climate Data Store
 - Creation of adaptors, integration in CDS Toolbox**
 - Documentation
 - Supporting documentation (ATBD, PQAD, PUGS, ...)**
 - Evaluation and Assessment
 - EQC, own QC procedures, benchmarking, cross-ECV consistency**
 - User support
 - Service desks opened for all services**

Example of Dataset access in the CDS

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ECMWF

Climate Change
Service

Joaquin Munoz Sabater

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This is a new service -- your feedback will help us to improve it

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Soil moisture gridded data from 1978 to present

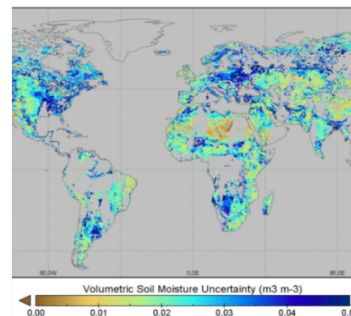
Overview Download data Quality assessment Documentation

This dataset provides estimates of **soil moisture** over the globe from a large set of satellite sensors. It is based on the ESA Climate Change Initiative soil moisture version 03.3 and represents the current state-of-the-art for satellite-based soil moisture climate data record production, in line with the "Systematic observation requirements for satellite-based products for climate" as defined by GCOS (Global Climate Observing System). Data are on a regular latitude/longitude grid expectedly with gaps in space and time.

When dealing with satellite data it is common to encounter references to Climate Data Records (CDR) and interim-CDR (ICDR). For this dataset, both the ICDR and CDR parts of each product were generated using the same software and algorithms. The CDR is intended to have sufficient length, consistency, and continuity to detect climate variability and change. The ICDR provides a short-delay access to current data where consistency with the CDR baseline is expected but was not extensively checked. The dataset contains the following products: "active", "passive" and "combined". The "active" and "passive" products were created by using scatterometer and radiometer soil moisture products, respectively. The "combined" product results from a blend based on the two previous products.

This dataset is produced on behalf of the Copernicus Climate Change Service (C3S).

Volumetric Soil Moisture Uncertainty



DATA DESCRIPTION	
Data type	Gridded
Projection	Regular latitude-longitude grid
Horizontal coverage	Global
Horizontal resolution	0.25° x 0.25°
Temporal coverage	1978 to present
Temporal resolution	Daily, 10-day, Monthly
File format	NetCDF
Conventions	Climate and Forecast (CF) Metadata Convention v1.8
Versions	v201706, v201812, v201912, v202012
Update frequency	ICDR: 10-day with a 10-day latency. CDR: annual.

MAIN VARIABLES		
Name	Units	Description
Surface soil moisture	%	Content of liquid water in a surface soil layer of 2 to 5 cm depth expressed as the percentage of total saturation

Contact

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Publication date

2018-10-25

Landing page

Example of Dataset access in the CDS

Retrieving data

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Soil moisture gridded data from 1978 to present

Overview Download data Documentation

Variable [?](#)

Soil moisture saturation

Time aggregation [?](#)

Day average 10-day average

Year

<input type="checkbox"/> 1978	<input type="checkbox"/> 1979	<input type="checkbox"/> 1980
<input type="checkbox"/> 1984	<input type="checkbox"/> 1985	<input type="checkbox"/> 1986
<input type="checkbox"/> 1990	<input type="checkbox"/> 1991	<input type="checkbox"/> 1992
<input type="checkbox"/> 1996	<input type="checkbox"/> 1997	<input type="checkbox"/> 1998
<input type="checkbox"/> 2002	<input type="checkbox"/> 2003	<input type="checkbox"/> 2004
<input type="checkbox"/> 2008	<input type="checkbox"/> 2009	<input type="checkbox"/> 2010
<input type="checkbox"/> 2014	<input type="checkbox"/> 2015	<input type="checkbox"/> 2016

Month

<input type="checkbox"/> January	<input type="checkbox"/> February	<input type="checkbox"/> March
<input type="checkbox"/> July	<input type="checkbox"/> August	<input type="checkbox"/> Septe

Day

<input type="checkbox"/> 01	<input type="checkbox"/> 02	<input type="checkbox"/> 03	<input type="checkbox"/> 04	<input type="checkbox"/> 05	<input type="checkbox"/> 06
<input type="checkbox"/> 07	<input type="checkbox"/> 08	<input type="checkbox"/> 09	<input type="checkbox"/> 10	<input type="checkbox"/> 11	<input type="checkbox"/> 12
<input type="checkbox"/> 13	<input type="checkbox"/> 14	<input checked="" type="checkbox"/> 15	<input type="checkbox"/> 16	<input type="checkbox"/> 17	<input type="checkbox"/> 18
<input type="checkbox"/> 19	<input type="checkbox"/> 20	<input type="checkbox"/> 21	<input type="checkbox"/> 22	<input type="checkbox"/> 23	<input type="checkbox"/> 24
<input type="checkbox"/> 25	<input type="checkbox"/> 26	<input type="checkbox"/> 27	<input type="checkbox"/> 28	<input type="checkbox"/> 29	<input type="checkbox"/> 30
<input type="checkbox"/> 31					<input type="checkbox"/> 31

Select all Clear all

Format [?](#)

Zip file (.zip) Compressed tar file (.tar.gz)

Type of sensor [?](#)

Active Passive Combined passive and active

Select all Clear all

Type of record [?](#)

ICDR (Intermediate climate data record) CDR (Climate data record)

Select all Clear all

Version

v201706.0.0 v201801.0.0 v201812.0.0

Select all Clear all

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Show API request Not yet toolbox compatible Submit Form

Example of Dataset access in the CDS

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Soil moisture gridded data from 1978 to present

The system session is complete. Please report any issues to user support.

[Overview](#)

[Download data](#)

[Documentation](#)

- [Algorithm theoretical baseline document v2.2 \(3.2M PDF\)](#)

Provides in-depth documentation on the algorithms used to derive the dataset(s).

- [Product user guide and specification document v2.3 \(1.9M PDF\)](#)

Summarizes the characteristics of the dataset(s) in a concise manner with focus on: space and time extent and resolution; data formats, metadata and flags; description of variables, strengths and limitations.

- [Product quality assurance document v1.1 \(2.5M PDF\)](#)

Describes the data quality assurance process applied by the data producer before release of the dataset(s).

- [Product quality assessment report v1.1 \(3.4M PDF\)](#)

Provides the latest report on data quality obtained according to methodologies described in the product quality assurance document

- [Target requirements document v1.0 \(845.7K PDF\)](#)

Summarises the minimum requirements identified for the dataset(s) regarding, among others, data quality, timeliness and data format.

- [Gap analysis document v1.0 \(1.4M PDF\)](#)

Discusses identified gaps of the dataset(s) with respect to their target requirements.

- [System quality assurance document v1.1 \(1.1M PDF\)](#)

Describes the processing chain and procedures in place at the data provides.

Documentation

Example of Dataset access in the CDS

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- Overview
- Download data
- Quality assessment
- Documentation

This is a new feature, work in progress. Should any inconsistency be found, please report to copernicus-support@ecmwf.int

The CDS datasets are assessed by the Evaluation and Quality Control (EQC) function of C3S independently of the data supplier. EQC encompasses a framework of processes aimed to assure technical and scientific quality harmonized across all dataset types available through the CDS. During the EQC process, the documentation provided with the dataset is scrutinized and data are checked for usability and reliability.

Variable:

Volumetric surface soil moisture ✕

Type of sensor:

Combined passive and active ✕

Time aggregation:

10-day average ✕

Type of record:

CDR (Climate data record) ✕

Version:

v201812.0.0 ✕

Quality Assurance

▼ Variable: Volumetric surface soil moisture - Type of sensor: Combined passive and active - Time aggregation: 10-day average - Type of record: CDR (Climate data record) - Version: v201812.0.0 [🔗](#) Last updated on 23/08/2021

INTRODUCTION	USER DOCUMENTATION	ACCESS	INDEPENDENT ASSESSMENT
Dataset overview	User guide	Toolbox compatibility	Data check
Temporal and spatial coverage and resolution	Scientific methodology	Archive	Expert evaluation
Providers	Uncertainty quantification		Dataset maturity
Dataset version	Validation		Key strengths and limitations
Data update	Inter-comparison		



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C3S: <https://climate.copernicus.eu/>

Climate Data Store: <https://cds.climate.copernicus.eu/>