Copernicus Climate Change Service

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Copernicus is the European Union's Earth Observation Programme.

Combines satellite observations and in-situ measurements.

Services transform this raw data into value-added geo-information products.

ECMWF entrusted to implement Climate Change (C3S) and Atmosphere Monitoring (CAMS) services.
**Data Store Infrastructure in a nutshell**

**Simple, consistent, harmonized, intuitive, informative interfaces**
- UI | API | Toolbox | CSW

**Robust, reliable Backend**
- QoS | Interoperable | Scalable | Automatized | Monitored

**Access to data and compute capabilities**
- Discover | Retrieve | Process | Visualize

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**In-house Cloud Infrastructure**
- Monitored | Elastic | Scalable
Copernicus Climate Change Service – the nexus between observations and society

https://cds.climate.copernicus.eu

DATA

Observations

Climate Data Store
Simplification / Standardisation

Traceability / Transparency

INFORMATION

Legislators (EU)
Business
Citizen

106,000+ registered users

Free and open data that is traceable and transparent

109 Catalogued Datasets
24 catalogued public applications
+ 19 available the European Climate Data Explore (EEA)
ECVs operational services

C3S supports 22 ECV services grouped in 5 thematic areas:

**Atmospheric physics**
- Precipitation
- Surface radiation budget
- Water vapour
- Cloud properties
- Earth radiation budget

**Atmospheric composition**
- Carbon dioxide
- Methane
- Ozone
- Aerosol

**Ocean**
- Sea surface temperature
- Sea level
- Sea ice
- Ocean colour

**Land hydrology & cryosphere**
- Lakes
- Glaciers
- Ice sheets & ice shelves
- Soil moisture

**Land biosphere**
- Albedo
- Land cover
- Fraction of absorbed photosynthetic
- Leaf area index
- Fire

**ECV products that are**

- State-of-the-art
  - Coordination with ESA CCI, EUMETSAT/SAFs & 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 & Traceable
  - Access through the Climate Data Store
  - Documentation
  - Quality Assurance
  - User support

Scientific requirements are based on Global Climate Observing System (GCOS) framework.
Essential climate variables as climate indicators

Global Temperature

- C3S has 22 ECVs available
- Increase above 1850-1900 reference level
- C3S has 22 ECVs available

Temperature

- Global temperature, 1980-2010, Global
- Increase of around 0.5°C
- Increase of around 2.2°C
- Increase of around 3°C

Ice sheets

- Ice sheets have lost around 340 Gt
- Ice sheets have lost around 1390 Gt

Glaciers

- Glaciers have thinned
- Glaciers have thinned by 30 m

Sea Ice

- Sea ice extent has decreased
- Sea ice extent has decreased by 12.2%
- Sea ice extent has decreased by 0.4%

Cryosphere climate indicators

- Annual cumulative sea ice extent loss (460 Gt/year)
- Volume of Lake Garda
- Ice volume of European Alps
- Area of Spain

Global 60-month average temperature

- ER5
- GISTEMPv4
- NOAAGlobalTempv5
- JRA-55
- HadCRUT5
- Berkeley Earth
Reanalysis uses past observations with today’s weather forecast model

- **Complete**: combining vast amounts of observations into (global) fields
  “reanalysis is a smart machine”

- **Consistent**: use the same physical model and data assimilation system throughout

- **Convenient**: “maps without gaps”, always available in the same way

- provide an uncertainty estimate
A new tool for monitoring a warming climate

climate.copernicus.eu/climate-indicators
climate.copernicus.eu/esotc/2020
Seasonal predictions

Forecast and hindcast data are openly available here: →
New climate projection data and operating capability in the CDS

**CMIP6 simulations**: historical simulations and scenario runs;
- new functionality (e.g. WPS for sub-setting on download)
- Pre-calculated ETCCDI nearly ready to be published

**World-wide CORDEX simulations for the CDS**
- including non-European regions (EURO-CORDEX, Med-CORDEX, Arctic, Africa, North America, South America are already available, others will come soon)
- Give access to data already available at ESGF (and align it to C3S requirements)
- Give access to data not yet available at ESGF
- Make available data from multi-region experiments (e.g. CORDEX-CORE)
- Establish operational connection with the IPCC Climate Atlas
# Applications published since July 2021

| Date of Publication | Contract | Application Title |
|---------------------|----------|-------------------|
| 01/07/2021          | C3S-422-Lot2-VITO | Urban climate for cities in Europe from 2008 to 2017 [https://cds.climate.copernicus.eu/cdsapp#!/software/app-health-urban-climate?tab=overview](https://cds.climate.copernicus.eu/cdsapp#!/software/app-health-urban-climate?tab=overview) |
| 01/07/2021          | C3S-429d-CMCC | Soil erosion explorer for Italy from 1981 to 2080 [https://cds.climate.copernicus.eu/cdsapp#!/software/app-soil-erosion-explorer-italy?tab=overview](https://cds.climate.copernicus.eu/cdsapp#!/software/app-soil-erosion-explorer-italy?tab=overview) |
| 01/07/2021          | C3S-429d-CMCC | What-if analysis tool for soil erosion in Italy from 1981 to 2080 [https://cds.climate.copernicus.eu/cdsapp#!/software/app-soil-erosion-what-if-analysis?tab=overview](https://cds.climate.copernicus.eu/cdsapp#!/software/app-soil-erosion-what-if-analysis?tab=overview) |
| 01/10/2021          | C3S_312b_Lot1 | Global latitude-height distribution of tropospheric humidity [https://cds.climate.copernicus.eu/cdsapp#!/software/app-satellite-humidity-latitude-distribution?tab=app](https://cds.climate.copernicus.eu/cdsapp#!/software/app-satellite-humidity-latitude-distribution?tab=app) |
| 04/11/2021          | C3S_435_Lot6_WEMC | European energy and climate data explorer [https://cds.climate.copernicus.eu/cdsapp#!/software/app-energy-explorer-europe?tab=overview](https://cds.climate.copernicus.eu/cdsapp#!/software/app-energy-explorer-europe?tab=overview) |
| 04/11/2021          | C3S_427-VITO | Thermal suitability for fish species habitat [https://cds.climate.copernicus.eu/cdsapp#!/software/app-biodiversity-thermal-suitalibity-fish?tab=overview](https://cds.climate.copernicus.eu/cdsapp#!/software/app-biodiversity-thermal-suitalibity-fish?tab=overview) |
| 05/11/2021          | C3S_422_Lot2-DELTARES | Indicators of water level change for European coasts in the 21st Century [https://cds.climate.copernicus.eu/cdsapp#!/software/app-coastal-indicators-waves-projections?tab=app](https://cds.climate.copernicus.eu/cdsapp#!/software/app-coastal-indicators-waves-projections?tab=app) |
| 05/11/2021          | Internal | C3S monthly climate bulletin explorer [https://cds.climate.copernicus.eu/cdsapp#!/software/app-c3s-monthly-climate-bulletin-explorer?tab=app](https://cds.climate.copernicus.eu/cdsapp#!/software/app-c3s-monthly-climate-bulletin-explorer?tab=app) |
| 10/11/2021          | Internal | Climate monitoring and volcanic eruptions [https://cds.climate.copernicus.eu/cdsapp#!/software/app-climate-monitoring-volcanoes?tab=overview](https://cds.climate.copernicus.eu/cdsapp#!/software/app-climate-monitoring-volcanoes?tab=overview) |
New Applications: Global tropospheric humidity explorer & European Coastal Areas

European Storm Surge climate data on the storminess in European coastal seas
Dataset of storm surge, tide and wave conditions, including the effect of sea level rise, for all of Europe’s coastal waters.

Latitude-height distribution of humidity and its variability in the lowest 12 kilometers of Earth's atmosphere, from Earth observations [https://bit.ly/3bT2L1o](https://bit.ly/3bT2L1o)
## Status of EQC integration into CDS catalogue

| Dataset category                     | #EQC tabs | Progress | #Total QARs* published | #Scientific assessments** |
|--------------------------------------|-----------|----------|------------------------|--------------------------|
| Seasonal forecasts                   | 6/6       |          | 787                    | 417                      |
| Climate projections (global)         | 5/6       | ![green](#) | 1499                  | 1499                     |
| Climate projections (regional)       | 1/1       | ![green](#) | 330                   | 330                      |
| Satellite observations               | 22/30     | ![green](#) | 404                   | 45                       |
| In situ observations                 | 2/2       | ![green](#) | 57                    | 5                        |
| Reanalysis                           | 14/18     | ![green](#) | 376                   | 332                      |

*QAR: Quality Assurance Report; **not all published yet

Over 30 EQC tabs for SIS datasets and applications becoming available in Q4/2021
Future of reanalysis

ERA6:
- Coupled ocean-atmosphere
- Better representation of key atmosphere-ocean processes and feedbacks
- C3S satellite data rescue
- ERA6L with enhanced land data assimilation

Apollo 17 image of the Earth, 07/12/1972
Credit - NASA

ECMWF forecast initialized from ERA5 reanalysis for the same date. Credit – Philippe Lopez, ECMWF
Help and support

We provide a dedicated user support service to aid Climate Change Service data discovery, dissemination, understanding and use by all users. The user support service currently includes a Knowledge Base accessible 24/7 and a friendly manned helpdesk.

24/7 Knowledge Base
The Knowledge Base provides documentation and answers to frequently asked questions.

Forum
For users of the C3S services become part of the community, work together and support each other.

Contact us
Can’t find the answer you’re looking for? Get in touch! Login to the C3S Enquiry Portal

User Satisfaction Surveys
We run user satisfaction surveys every year.
- 2020 Report
- 2019 Report
- 2018 Report
- 2017 Report

Your user story
We collect user stories to show the diversity and wide-range usage of our data and services. You will find here some examples. Contact us directly to share your user story with us.

User Training
C3S User Learning Services offers free training in how to use the Climate Data Store platform and its content.

For press inquiries:
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