C3S hydrological & soil moisture products

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### Open and free

Copernicus is the Earth observation component of the EU Space programme, looking at our planet and its environment to benefit all European citizens

- Authoritative source of data
- Based on latest science
- Fully transparent and traceable
- Quality information available

# CHANGE MARINE MONITORING. IS LAND MONITORING $\mathbf{D}$ SECURITY

EMERGENCY MANAGEMENT

### Why hydrological & soil moisture products?

Essential to characterize **flood and drought** events, with implications on environment, society, and economy

Relevant for **agriculture** & **water resource** management

Specific variables, such as soil moisture, precipitation, radiation, wind speed, temperature, river discharge, runoff to characterize events such as agroecological and hydrological droughts, persistent heatwaves, floods and their ecological and socioeconomic dimensions

#### Soil moisture

- affects the variability of the coupled water and energy fluxes
- a key factor in predicting droughts and floods
- important for temperature variability and heatwaves
- for the generation and location of precipitation

- Monitoring for evaluating and understanding
- Forecasting for early
- warning and emergency management
- Long-term climate change scenarios for adapting





### Land hydrology and cryosphere domains

#### Consortium led by EODC

ECVs: Soil Moisture, Lakes, Glaciers, Ice Sheets and Ice Shelves

Key product characteristics (Greenland)

- 250 m Gridded <u>Annual Ice Velocity Maps</u>
- Copernicus Sentinel-1 IW TOPS SAR
- Coverage: AIS margin (incl. iceshelves)
- Timeseries starts in 2014 Yearly updates

#### Key product characteristics (Antarctica)

- 200 m Gridded Annual Ice Velocity Maps
- Copernicus Sentinel-1 IW TOPS SAR
- Coverage: AIS margin (incl. iceshelves)
- C3S Service starts in March 2023 Yearly updates







Surope's eyes on Earth



# EUROPEAN STATE OF THE CLIMATE REPORT 2023

It provides a detailed analysis, with descriptions of climate conditions, key events and their impacts, and explores the associated variations in key climate variables from across the Earth system.





Compiled by the Copernicus Climate Change Service (C3S) and the World Meteorological Organization (WMO)



### **YEAR 2023**

It was the **second-warmest year** on record for Europe

There were a record number of days with **'extreme heat stress'** 

The **largest wildfire** ever recorded in the European Union

Periods of **significant drought** and extreme flooding

From October to December, a persistent west-to-east circulation brought storm activity, with higher-than-average precipitation and related flooding

The average **sea surface temperature** for the European ocean was the warmest on record



Copernicus Climate Change Service European State of the Climate | 2023



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# The year as a whole saw **drier-than-average surface soil moisture** across Europe.







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- For Europe as a whole, river flows were **the highest on record for December**, with 'exceptionally high' flow in almost a quarter of the river network.
- Record or near-record **high river flows** were seen in major river basins, including the Loire, Rhine and Danube, due to a series of **storms between October and December**.
- **Drought conditions** were seen in basins such as the Ebro, which saw near-record low flows in May, and the Po, which saw below-average river flow for the entire year, and near-record low flow from February to April.



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**2023**: A period of prolonged drought affected the Iberian Peninsula from February to May, whilst the majority of Europe saw with wetter-than-average conditions

Droughts are:

- increasing in frequency and severity in many parts of the world, including parts of Europe
- a transboundary problem
- a global hazard with significant economic, societal and environmental impacts







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# **VEAR 2022: prolonged period of drought**

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(d) C3S-SM-ACT



(b) ERA5-Land surface



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- Intercomparison of products to represent the magnitude, intensity and duration of major European drought events
- Characterization of uncertainty



C3S 511: Independent evaluation & quality control. Multi-product assessmemnts.

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**Europe 2022** 



## Climate Monitoring and Forecast for early warning

# Hydrological information for the water sector



Climate Change



Hydrology has a long memory of initial conditions

Water Sector - Probabilistic pan-European and global multi-model hydrological seasonal forecast and retrospective forecasts, in synergy with the CEMS hydrological seasonal forecasting component

What's coming next. **Operational Climate Water Service:** a fully operational water service across timescales (historical, seasonal, multi-decadal), expanding on the current C3S offer to reach a wider audience within the water sector



Long-term climate projections: adaptation under climate change scenarios

### European Climate Data Explorer



#### Projected trend of yearly Meteorological Droughts Magnitude in Sur

Interactive plot showing the 30-year rolling average of the yearly Meteorological Droughts Magnitude deviation from the 1981-2010 average, values are the median and likely values (66% probability of occurrence) envelope from an ensemble of climate models.



Climate Change Service

climate.copernicus.

https://climate-adapt.eea.europa.eu/en/knowledge/european-climatedata-explorer/agriculture

## Thank you !







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# OPERPICUS Europe's eyes on Earth

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