



PROGRAMME OF
THE EUROPEAN UNION



Implemented by



European
Commission



Emergency
Management

#EUSpace

An introduction to GloFAS

Christel Prudhomme and CEMS-Flood
teams at ECMWF and JRC



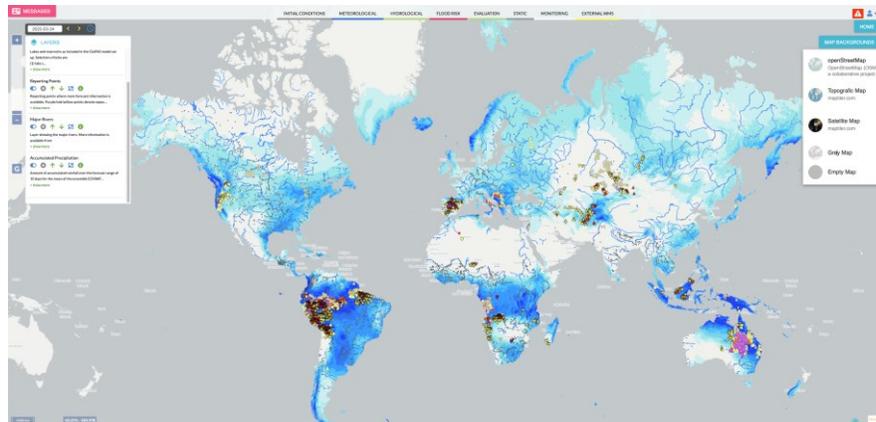
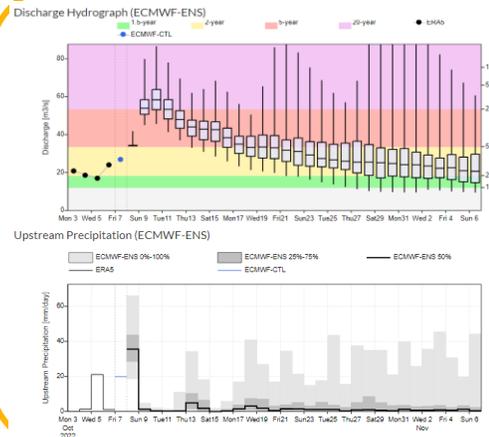
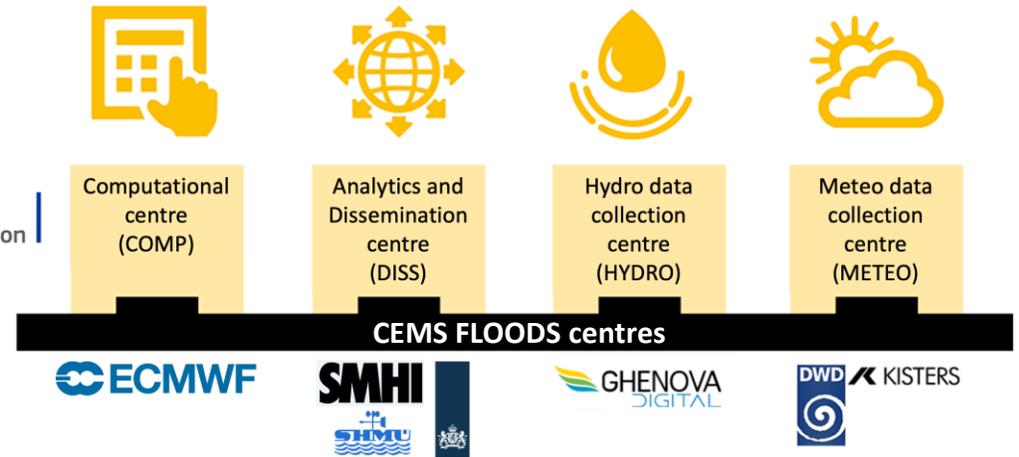
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What is GloFAS?



European Commission
JRC is CEMS FLOODS entrusted entity

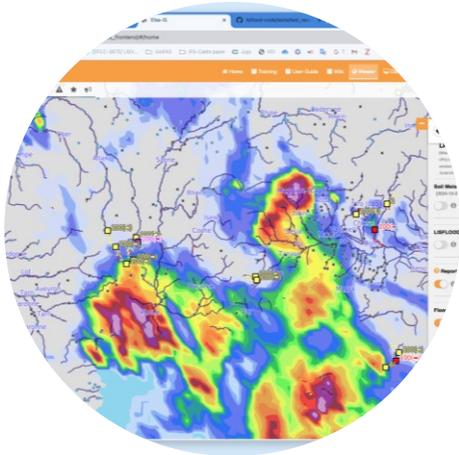


The **Global Flood Awareness Systems (GloFAS)** provide **complementary** flood forecast information to relevant stakeholders that support flood risk management at the national, regional and global level. They support **ERCC activities**. **GloFAS products** are freely accessible to all, and highlights **flood signal** over next 30 days and **hydrological outlooks** over next 7 months



What does GloFAS offer?

Flood products on interactive mapviewer



Over **30 forecasts and products**

Update from **daily to monthly**

Freely accessible

Demo by Gurpreet Dass and Nina Bossard

Data service

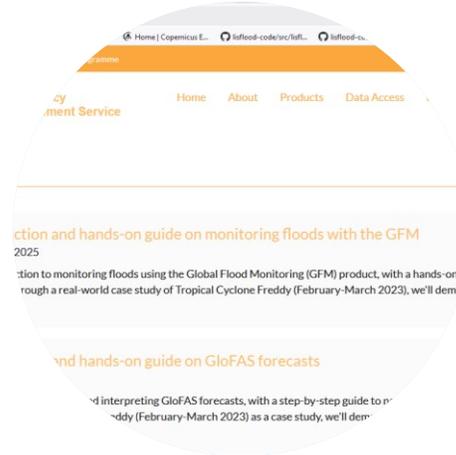


Data Store

Direct access to model outputs of historical reanalysis, forecasts & reforecasts

Freely accessible upon registration to ECMWF

Training



Webinars and tutorials

Available through, **GloFAS website, CEMS social media channels** and **EWDS repository**

Documentation and support

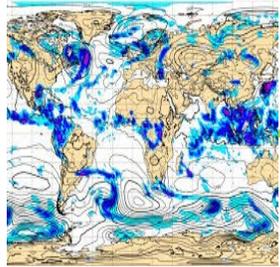


Wiki

documentation on modelling chain, products generation and data access

On-demand **support service**

At the core: CEMS Flood processing chain



Weather ERA5T to forecast date



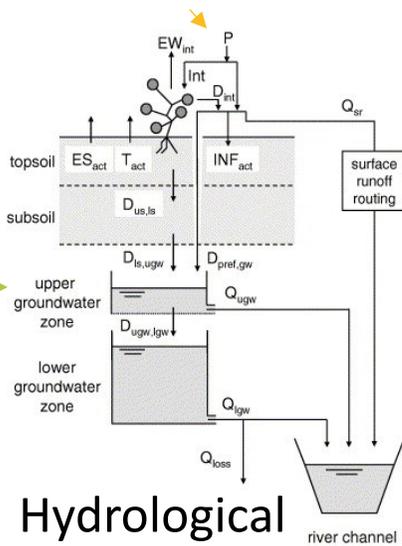
Weather forecasts up to 7 months

ECMWF ENS / SEAS5



Time-invariant data

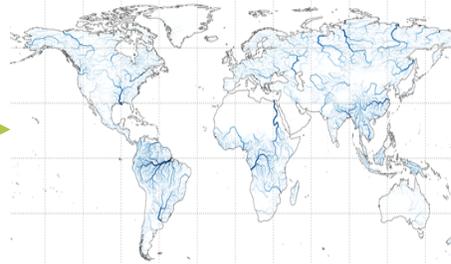
Geo-spatial maps, parameters



Hydrological Model

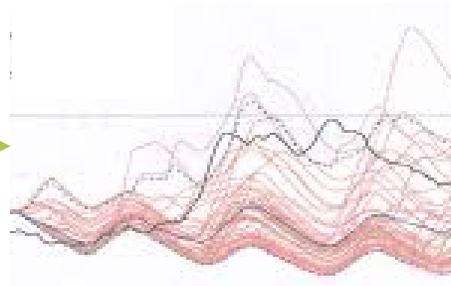
LISVAP, LISFLOOD

Surface fields at 5km resolution
Calibrated ~2000 catchments
Covering Global domain
Run daily



Hydrological status update

River discharge, Soil moisture, etc...

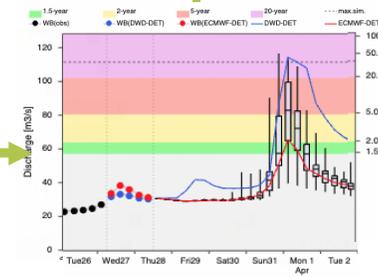


Ensemble hydrological forecast datasets

River discharge, soil moisture, etc..



Climatology
Flood thresholds



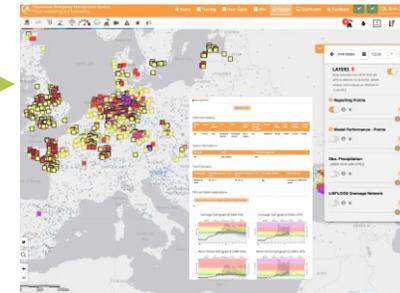
Hydrological forecast product generation

Flood hydrographs, seasonal outlooks, etc...



Data Service
EWDS

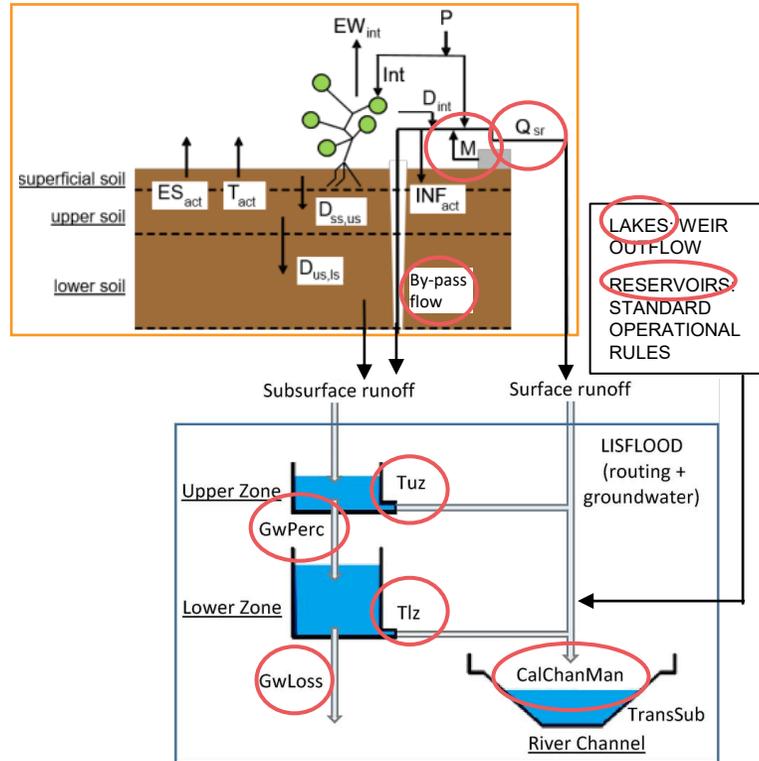
Reanalysis, forecasts, reforecast, seasonal forecasts and seasonal reforecasts



Web Service
CEMS EFAS/ GLOFAS



CEMS-Flood Open Source Hydrological Model



Open Source LISFLOOD

physically based and spatially distributed

- 6 land cover fractions within a pixel;
- 3 soil layers;
- 2 groundwater storages;
- kinematic wave routing in channels and floodplains;
- lakes and dams;
- water abstraction for anthropogenic use.

OUTPUT: all fluxes and states

Open Source code and ancillary tools; comprehensive documentation.

<https://github.com/ec-jrc/lisflood-code>

<https://github.com/ec-jrc/lisflood-calibration>

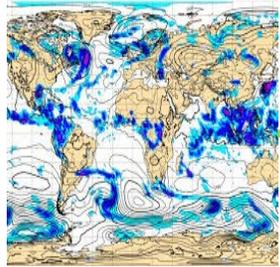
Open Source Implementation maps

<https://data.jrc.ec.europa.eu/dataset/68050d73-9c06-499c-a441-dc5053cb0c86>

<https://egusphere.copernicus.org/preprints/2023/egusphere-2023-1306/>

**New routing function
Requested in GloFAS survey 2023
Talk by Stafania Grimaldi**

CEMS Flood Forecasts across multiple time horizons



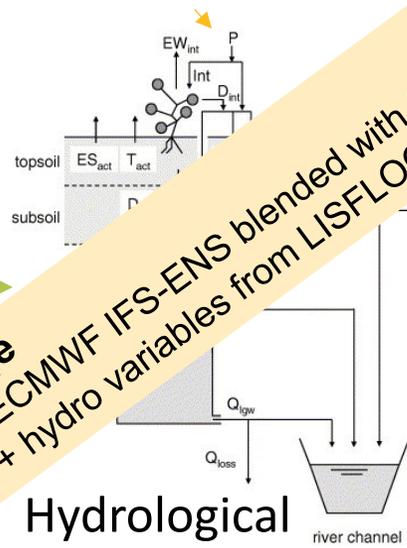
Weather
OBS/ ERA5 to
forecast date



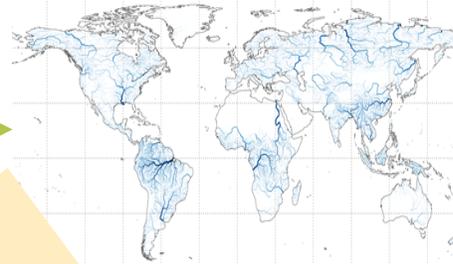
Time-invariant data
*Geo-spatial maps,
parameters*



Weather
forecast
to 7 months



Hydrological
Model
LISVAP, LISFLOOD



Hydrological status
update
*River discharge, Soil
moisture, etc...*



Ensemble
hydrological

Products (maps, graphs and metadata information) accessible from GloFAS-IS
Data (river discharge, soil wettnex index, snow water equivalent time series outputs) accessible from EWDS for downstream applications

Medium(long)-range
- ECMWF IFS-ENS blended with S2S
- Ensemble NWP
- Daily discharge + hydro variables from LISFLOOD

Sub-seasonal range
- IFS-ENS+S2S
- Daily discharge from LISFLOOD (to come in 2025)

Seasonal range
- SEAS5
- Daily river discharge + hydro variables from LISFLOOD

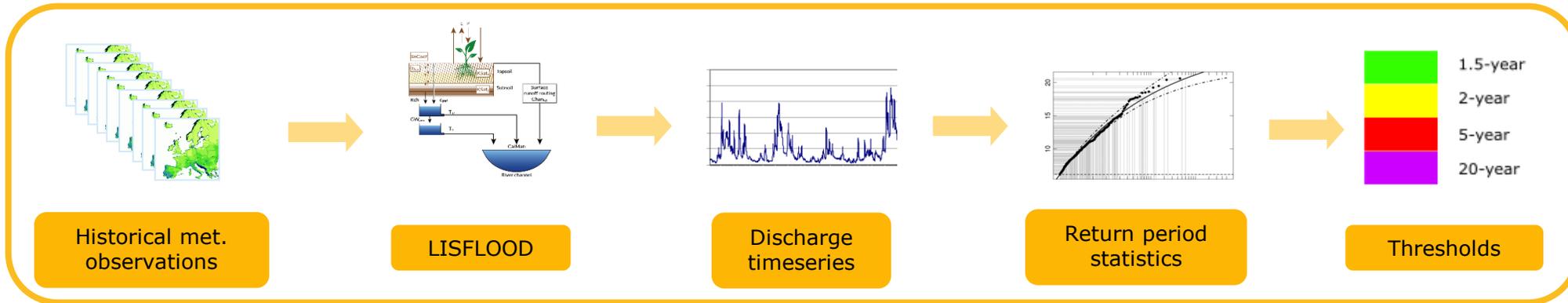




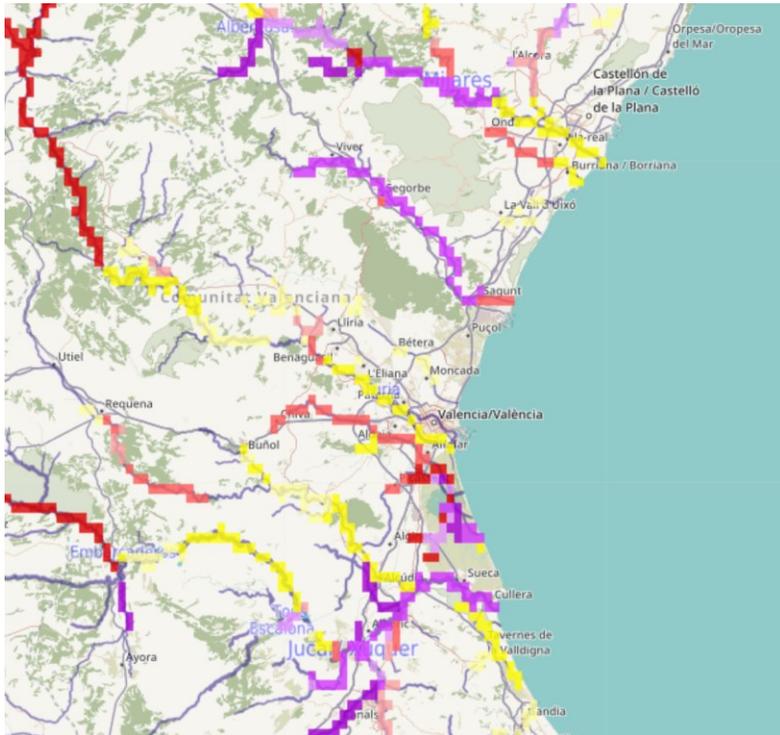
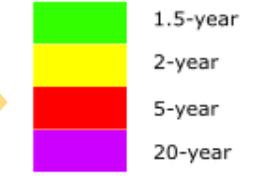
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CEMS-Flood products generation principle

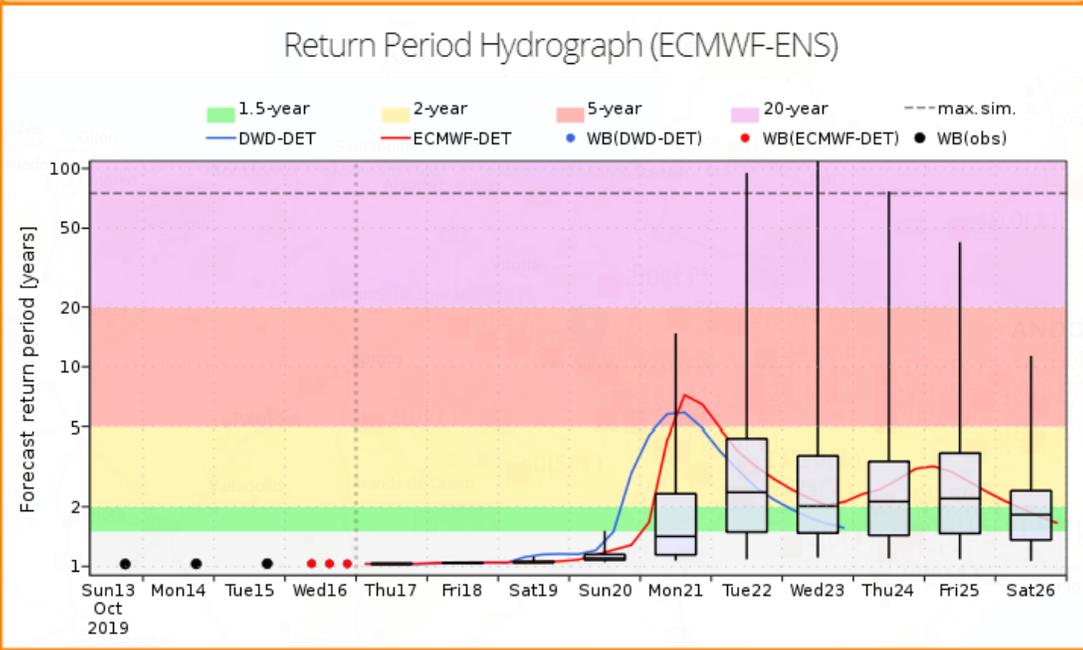


Reference thresholds
calculated once at each major release



Maximum probability to exceed a flood threshold over the forecast horizon

Return period hydrograph. Time series plot of the (6-hourly deterministic and daily probabilistic) discharge forecasts over the next 10 days. Compared against the flood severity thresholds (coloured return periods on the y-axis), the forecast indicates potential upcoming floods over the forecast window.



Comparison of forecast discharge data with reference threshold

Severity thresholds. Return periods (green to purple colours) and simulation maximum (dotted horizontal line) derived from the model climatology.

Ensemble forecast boxplot

- 100th perc. / max.
- 75th perc.
- 50th perc. / median
- 25th perc.
- 0th perc. / min.

Initial conditions period. Shows the simulations from observations (black dots; daily) and the fill-up (coloured dots; 6-hourly).

Forecast period. Starts at the vertical dotted line. Shows the two deterministic forecasts (single lines; 6-hourly) and ensemble forecast (daily boxplots; in this case ECMWF-ENS, as shown by the plot title).

Products created at each forecast update



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How are some of CEMS-Flood data used?

State of Global Water Resources 2023 Report

#StateOfWater

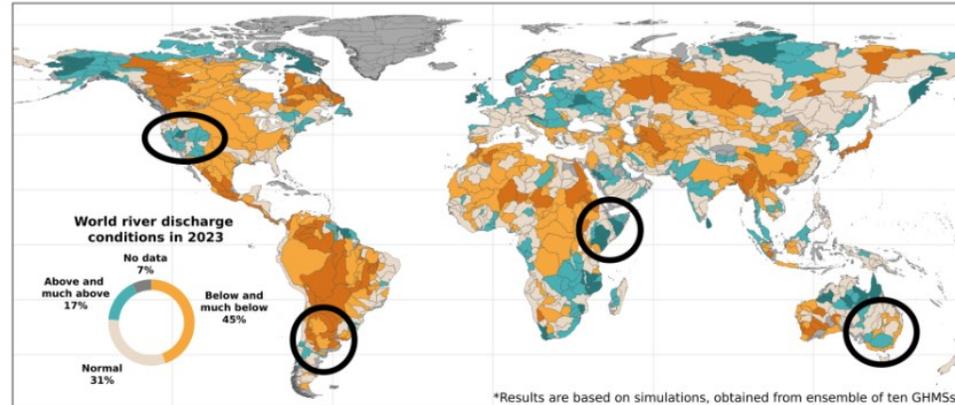
#StateOfClimate



2023: HALF OF THE GLOBE HAD DRY RIVER FLOW CONDITIONS



Mean river discharge for the year 2023 compared to the period of 1991-2020 (for basins larger than 10,000 km²).



much below below normal above much above



Uses GloFAS historical simulations for selected river basins

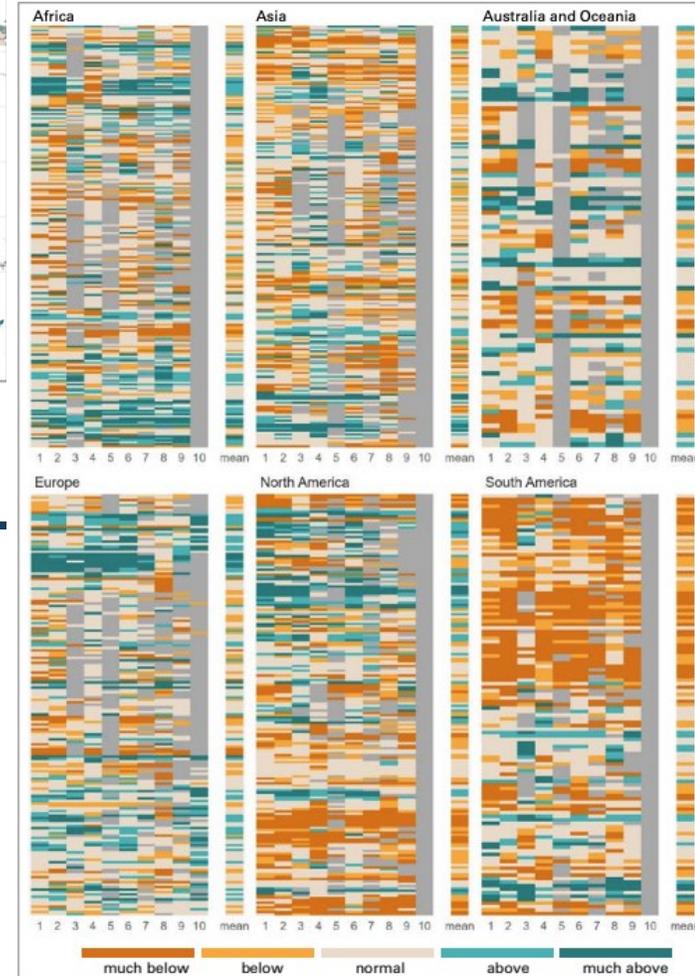


Figure A7. Simulated discharge rankings for the year 2023 for each basin by each of the GHMSs grouped by region. Note: 1 – DHI-GHM, 2 – GloFAS, 3 – TEJRA55, 4 – WWH, 5 – mHM, 6 – WaterGAP 2.2e, 7 – CaMa-Flood, 8 – CSSPv2, 9 – GEOGLWS, 10 – Wflow_sbm. Grey area indicates no data values for a specific basin.



WORLD METEOROLOGICAL ORGANIZATION

Early Warnings for All



WEATHER CLIMATE WATER



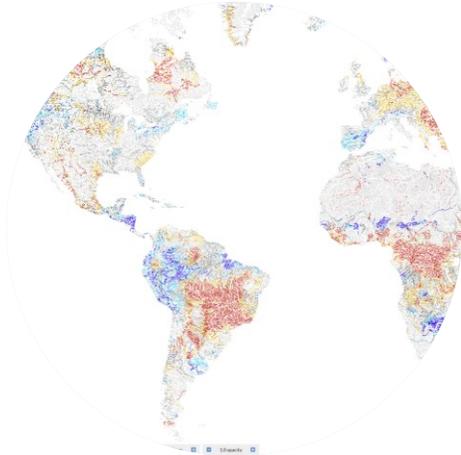
WORLD METEOROLOGICAL ORGANIZATION

WMO-No. 1362



What is new in GloFAS?

Seasonal outlook products

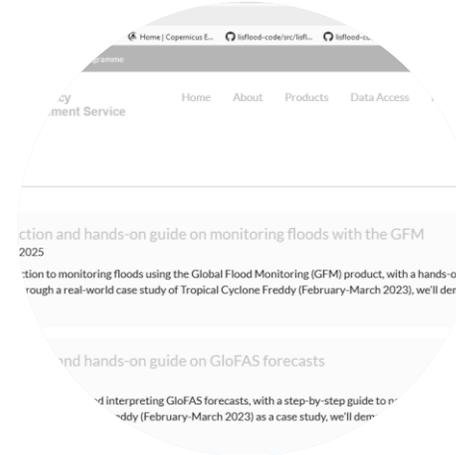


Extended sub-seasonal and seasonal forecasts
(expected Q2 2025)

Data service



Training



Documentation and support

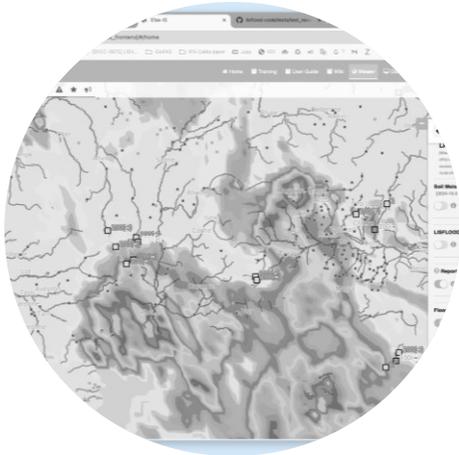


Requested in GloFAS survey 2023
Talk by Ervin Zsoter



What is new in GloFAS?

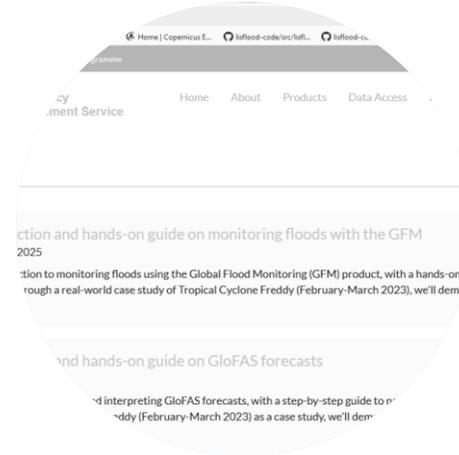
Flood products on interactive mapviewer



New dedicated Early Warning Data Store



Training



Documentation and support



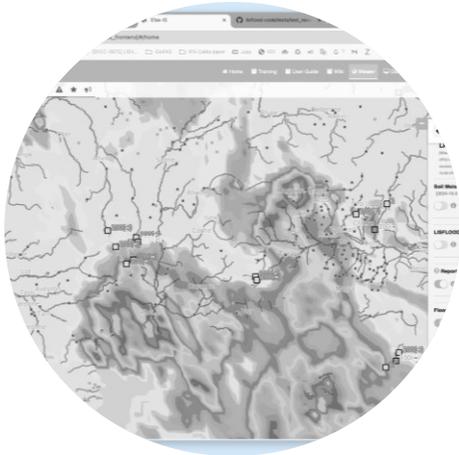
Improved data access through dedicated **CEMS Early Warning Data Store** since October (<https://ewds.climate.copernicus.eu/>)

Requested in GloFAS survey 2023 Workshop by Mohamed Azhar

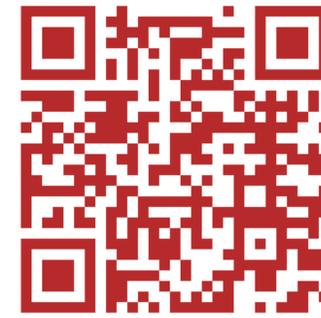


What is new in GloFAS?

Flood products on interactive mapviewer



Data service



Enhanced collection of YouTube videos



Documentation and support



Size-bite and long **videos** explaining GloFAS and some of its products

Sub-selection of videos in **French**

**Requested in GloFAS survey 2023
Workshop by Gurpreet Dass and Nina Bosshard**

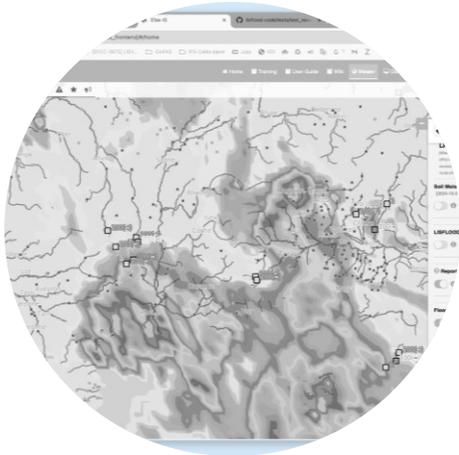


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What is new in GloFAS?

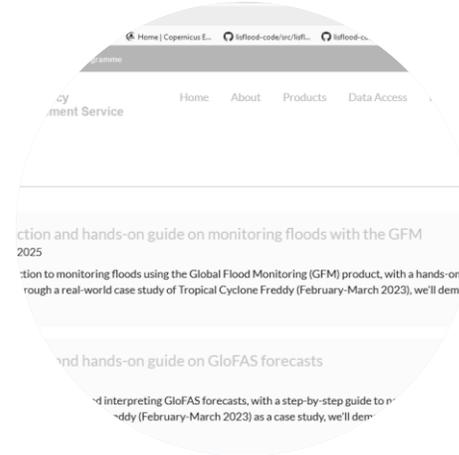
Flood products on interactive mapviewer



Data service



Training



Jupyter Notebooks



New **Jupyter notebooks** for EWDS data access and GloFAS data manipulation



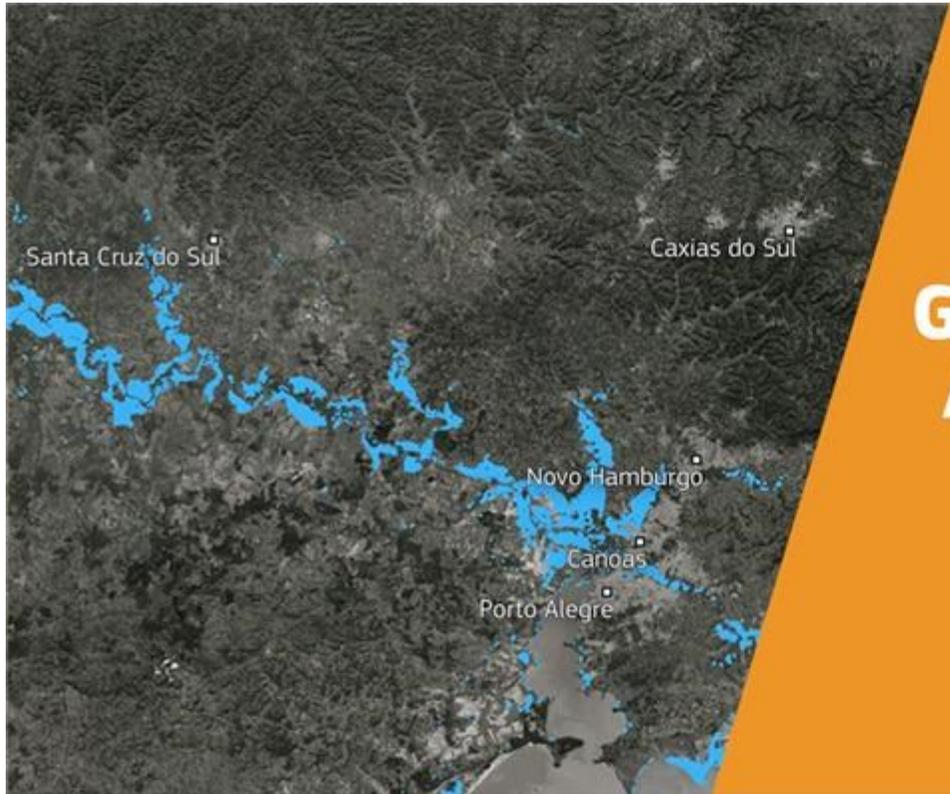
Requested in GloFAS survey 2023
Workshop by Mohamed Azhar



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Have your say to steer the future evolution!





2024 GloFAS and GFM Annual Survey

Have your say!
Deadline 4 April 2025



PROGRAMME OF THE
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Deadline extended to 7 April 2025!



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Thank you



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