



PROGRAMME OF
THE EUROPEAN UNION



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European
Commission



Emergency
Management

#EUSpace

An introduction to GloFAS

Christel Prudhomme and CEMS-Flood
teams at ECMWF and JRC



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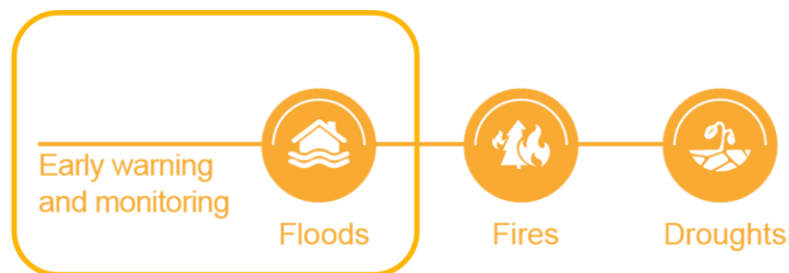
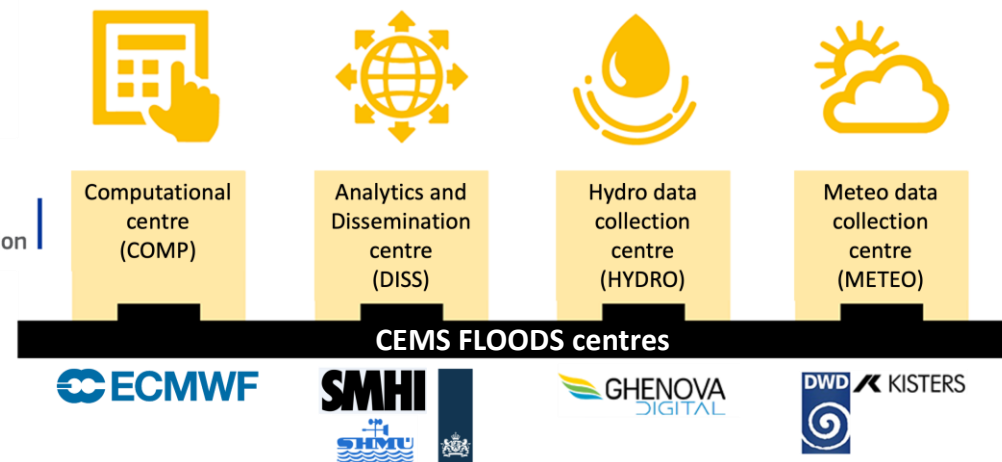
What is GloFAS?



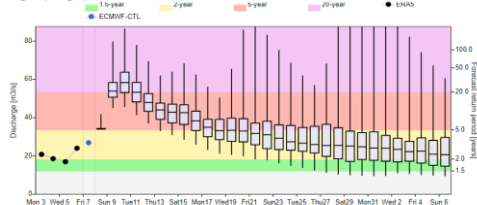
Source: ESA



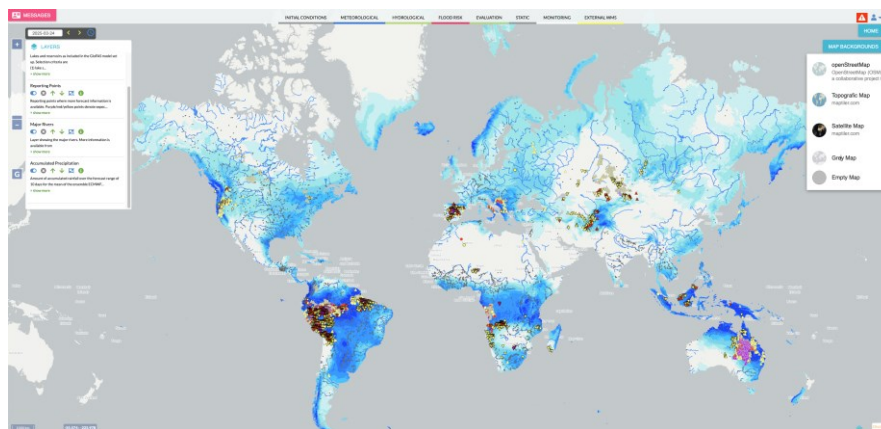
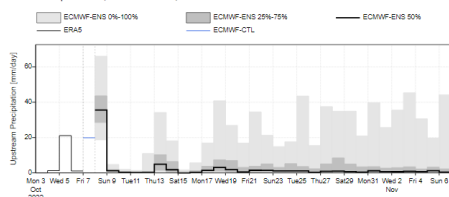
European Commission
JRC is CEMS FLOODS entrusted entity



Discharge Hydrograph (ECMWF-ENS)



Upstream Precipitation (ECMWF-ENS)

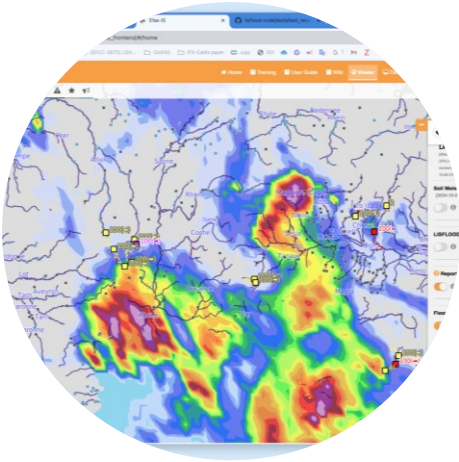


The **Global Flood Awareness Systems (GloFAS)** provide **complementary** flood forecast information to relevant stakeholders that support flood risk management at the national, regional and global level. They support **ERCC activities**. **GloFAS products** are freely accessible to all, and highlights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

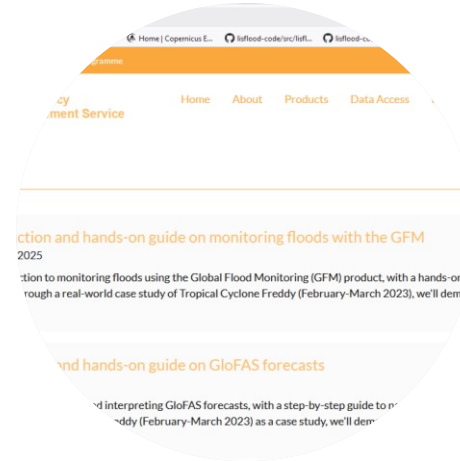


Data Store

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

Freely accessible upon registration to ECMWF

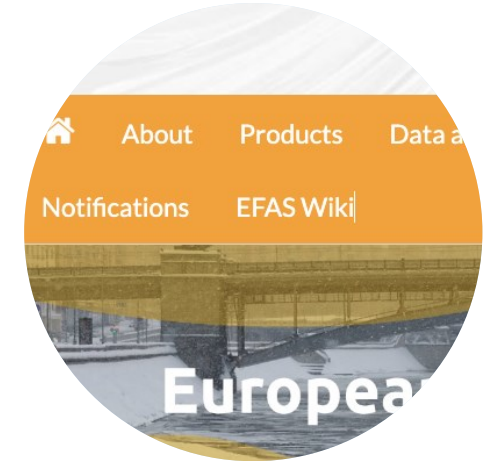
Training



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

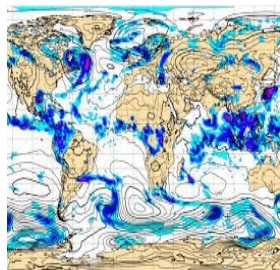
On-demand **support service**



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At the core: CEMS Flood processing chain



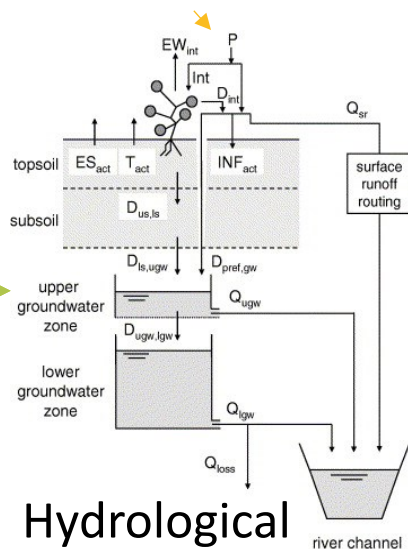
Weather
ERA5T to
forecast date



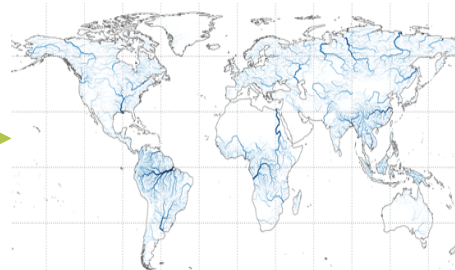
Weather
forecasts up
to 7 months
ECMWF ENS / SEAS5



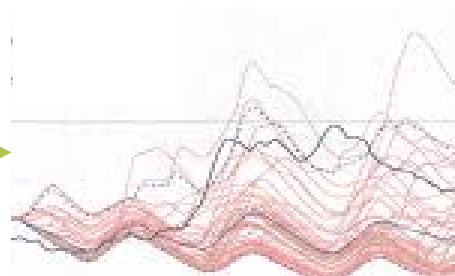
Time-invariant data
*Geo-spatial maps,
parameters*



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



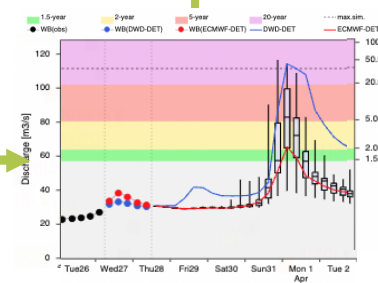
Hydrological status
update
*River discharge, Soil
moisture, etc...*



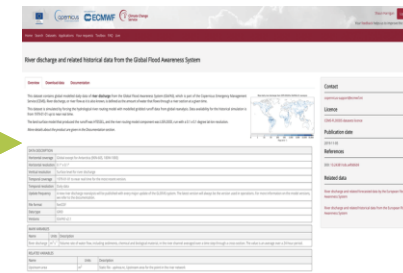
Ensemble
hydrological
forecast datasets
*River discharge, soil
moisture, etc..*



Climatology
Flood thresholds

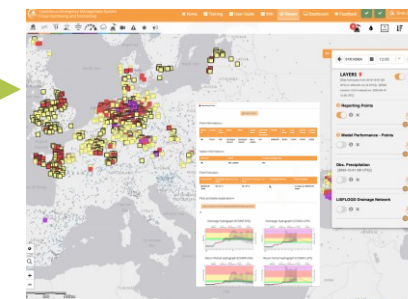


Hydrological
forecast product
generation
*Flood hydrographs, seasonal
outlooks, etc...*



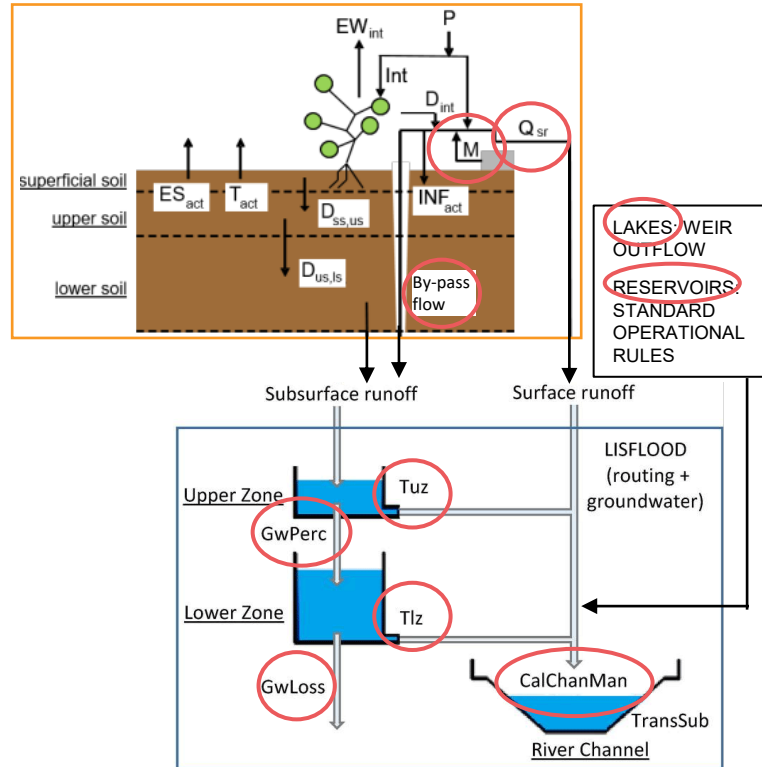
Data Service
EWDS

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/>

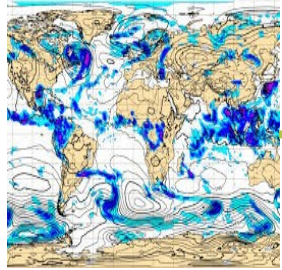
New routing function
Requested in GloFAS survey 2023
Talk by Stafania Grimaldi



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CEMS Flood Forecasts across multiple time horizons

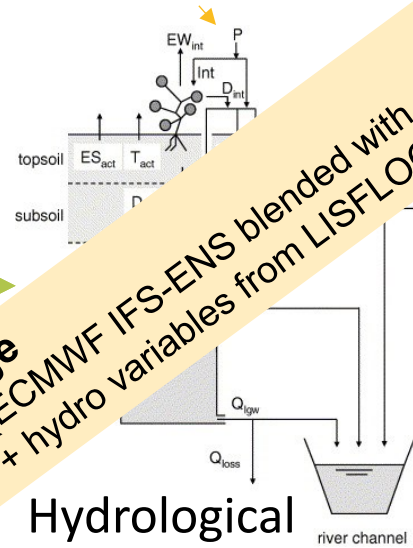


Weather
OBS/ ERA5 to
forecast date

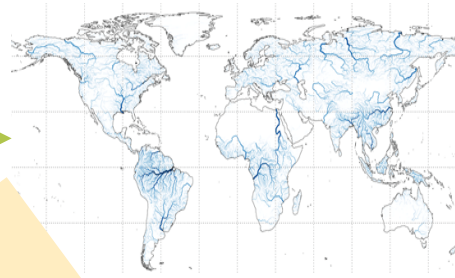


Time-invariant data

*Geo-spatial maps,
parameters*

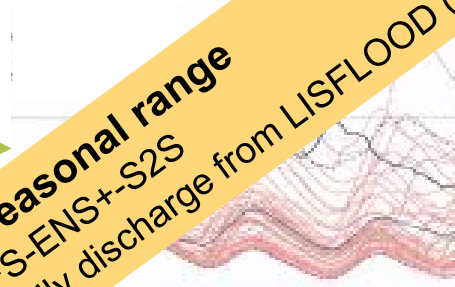


LISVAP, LISFLOOD



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
- Ensemble NWP (ECMWF IFS-ENS blended with S2S)
- 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

24h-30d

1-6w

1-7m

Lead time

daily

daily

monthly

Update frequency



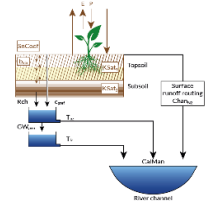
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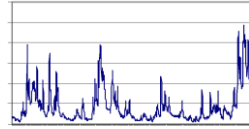
CEMS-Flood products generation principle



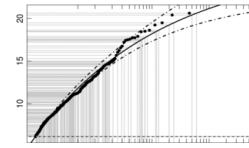
Historical met.
observations



LISFLOOD



Discharge
timeseries

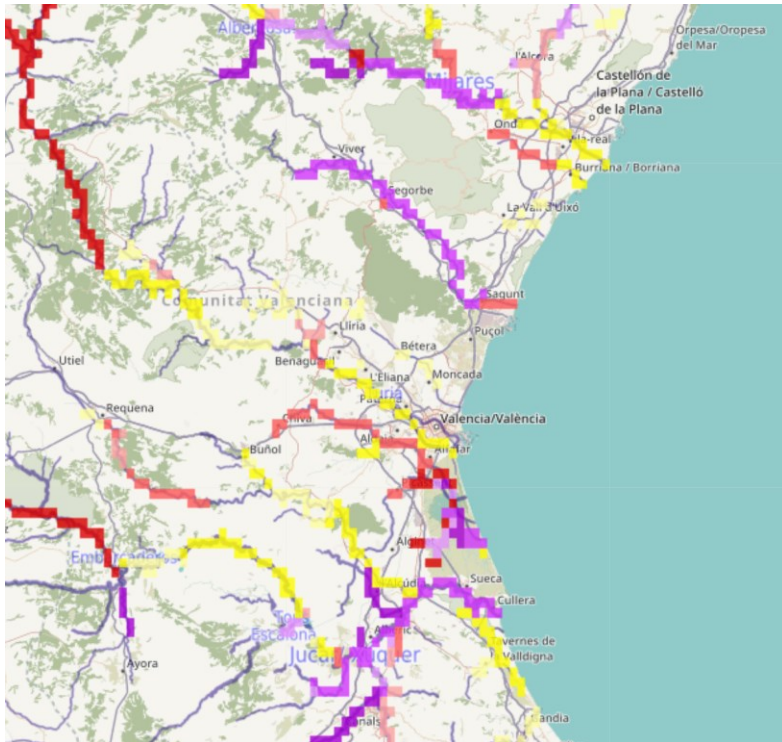


Return period
statistics



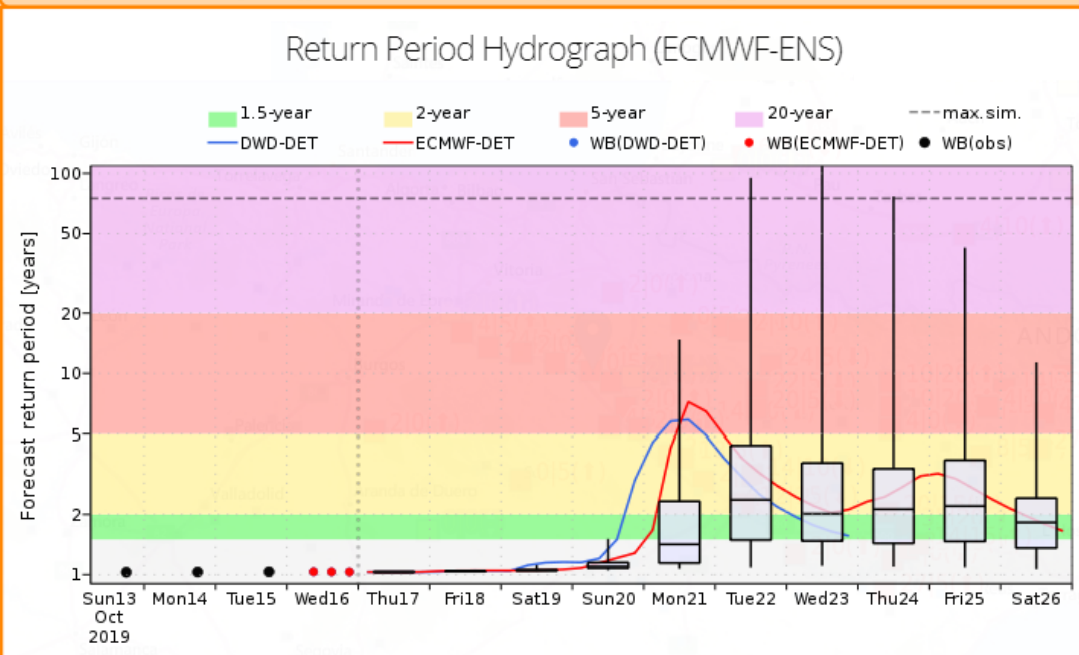
Thresholds

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.

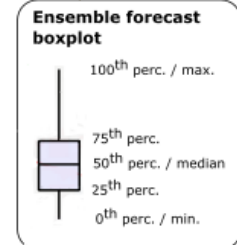


Initial conditions period.
Shows the simulations from
observations (black dots; daily)
and the fill-up (coloured dots;
6-hourly).

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).

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.



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

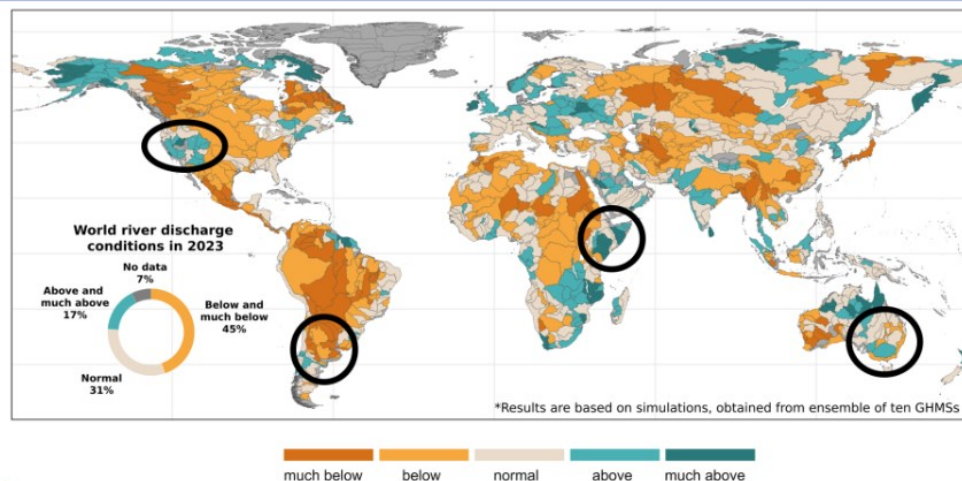
#StateOfClimate



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).



WORLD
METEOROLOGICAL
ORGANIZATION

Early
Warnings
for
All

1950-2025
75
SCIENCE for ACTION

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 – CFSv2, 9 – GEGLWS, 10 – Wflow_sbm. Grey area indicates no data values for a specific basin.

WEATHER CLIMATE WATER



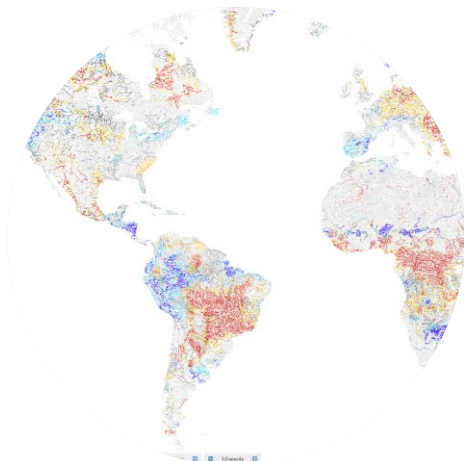
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ORGANIZATION

WMO-No. 1362



What is new in GloFAS?

Seasonal outlook products

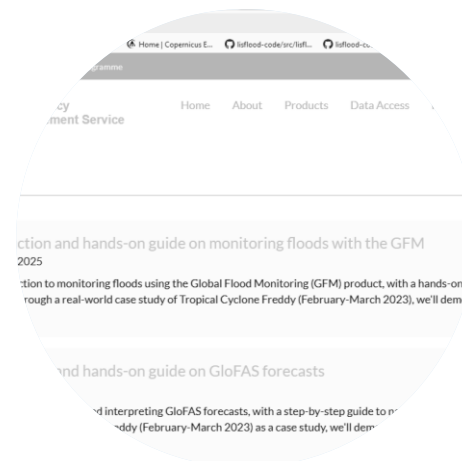


Extended sub-seasonal and seasonal forecasts
(expected Q2 2025)

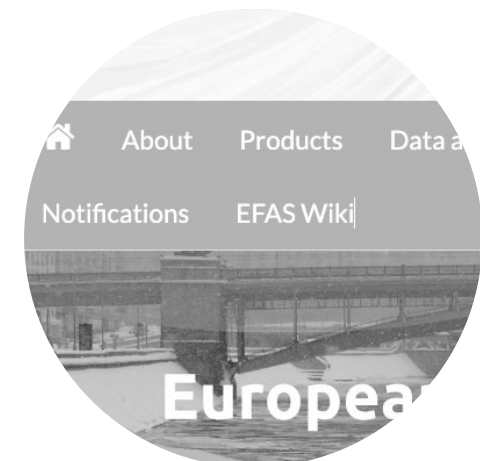
Data service



Training



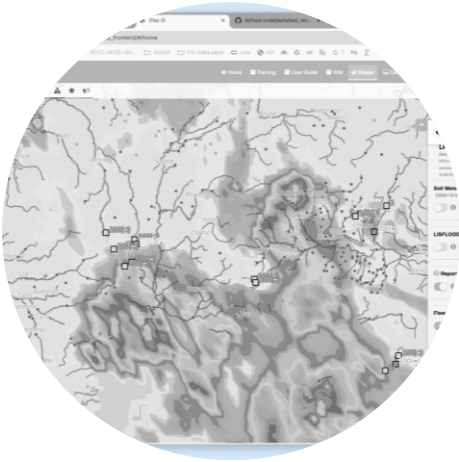
Documentation and support





What is new in GloFAS?

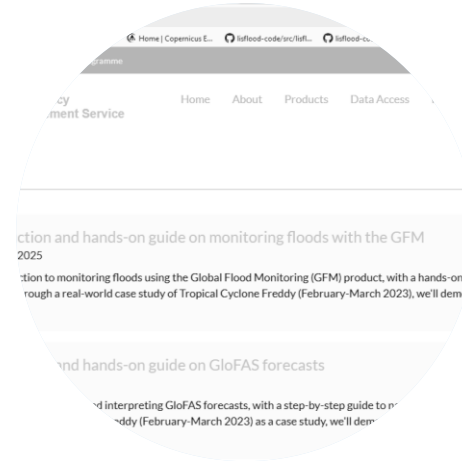
Flood products on
interactive mapviewer



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

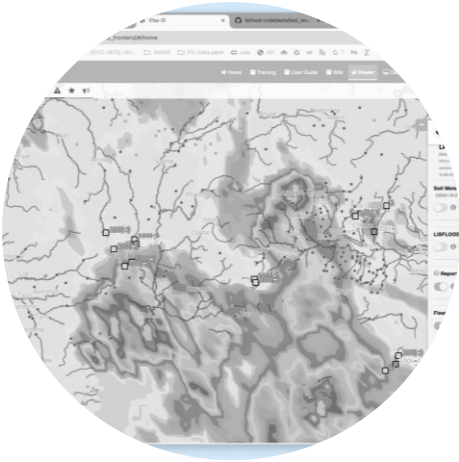


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What is new in GloFAS?

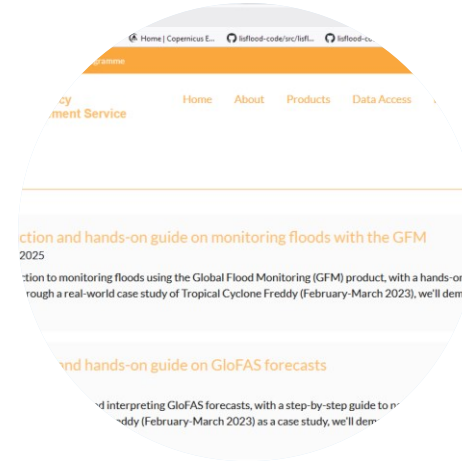
Flood products on
interactive mapviewer



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

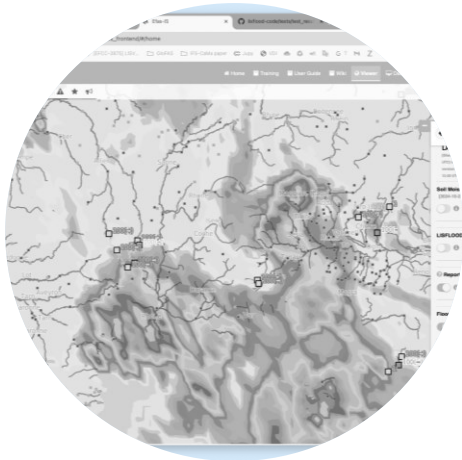


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What is new in GloFAS?

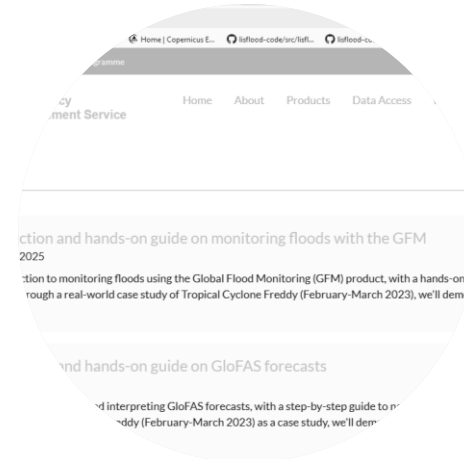
Flood products on
interactive mapviewer



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!



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Deadline extended to 7 April 2025!



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Thank you



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