

The Copernicus Global Flood Awareness Systems (GloFAS)

Overview and service evolution

GloFAS Map Viewer: <http://www.globalfloods.eu/>

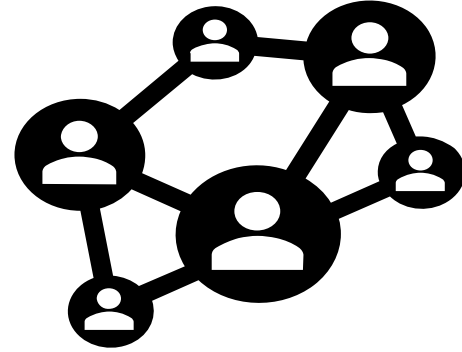
With contributions from the GloFAS team at ECMWF, at the JRC and also at the University of Reading





Collaborative effort

Operated by ECMWF, developed with JRC and other collaborators (Uni of Reading, RIMES, etc....)



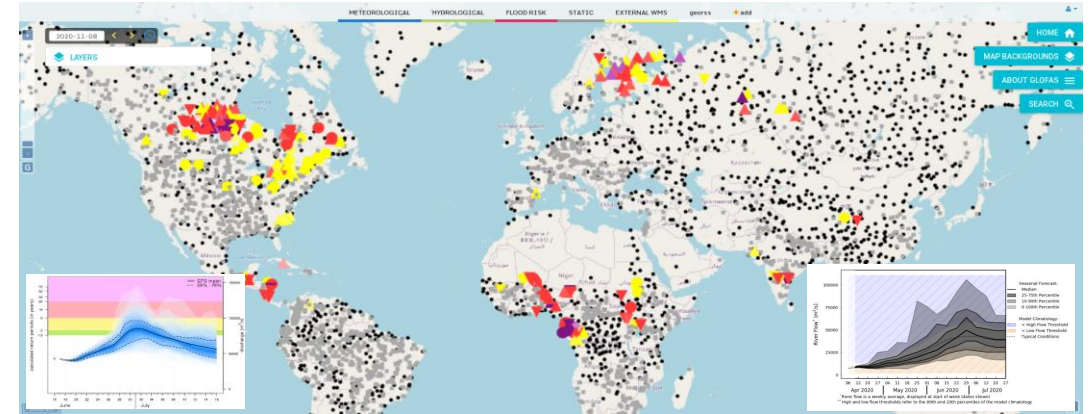
Global complementary information

Early hydrological and flood information, complementing national and local systems



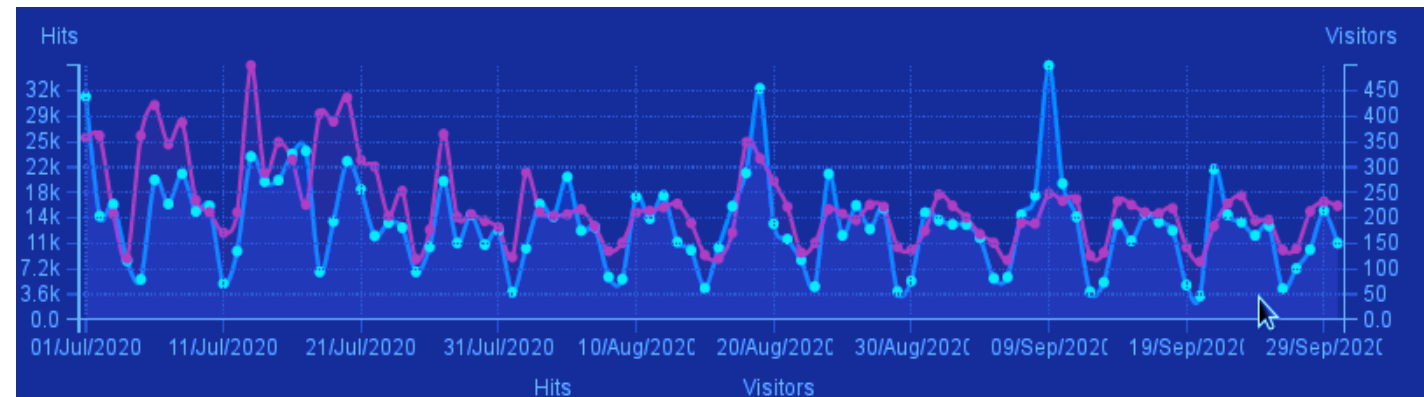
Probabilistic hydro forecasts

For next 30 days / next 16 week (seasonal) at 10km resolution globally



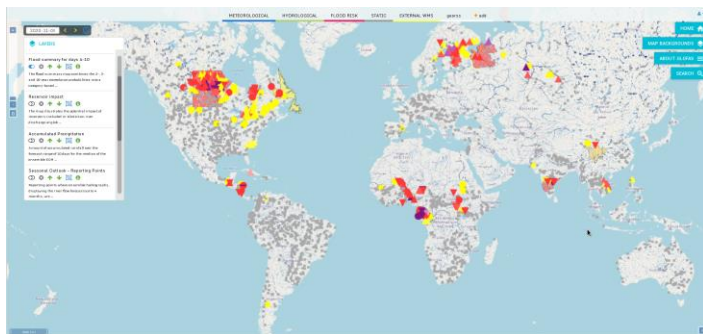
Open and free

To all upon registration (~6000 users of map viewer)



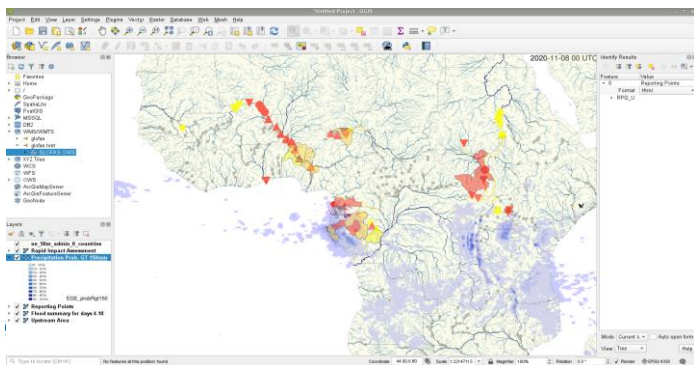
Web map viewer

- www.globalfloods.eu, 22+13 layers
- Forecasts available from Jan 2011



WMS-T

- www.globalfloods-ows.ecmwf.int
- All GloFAS web layers available in a GIS environment



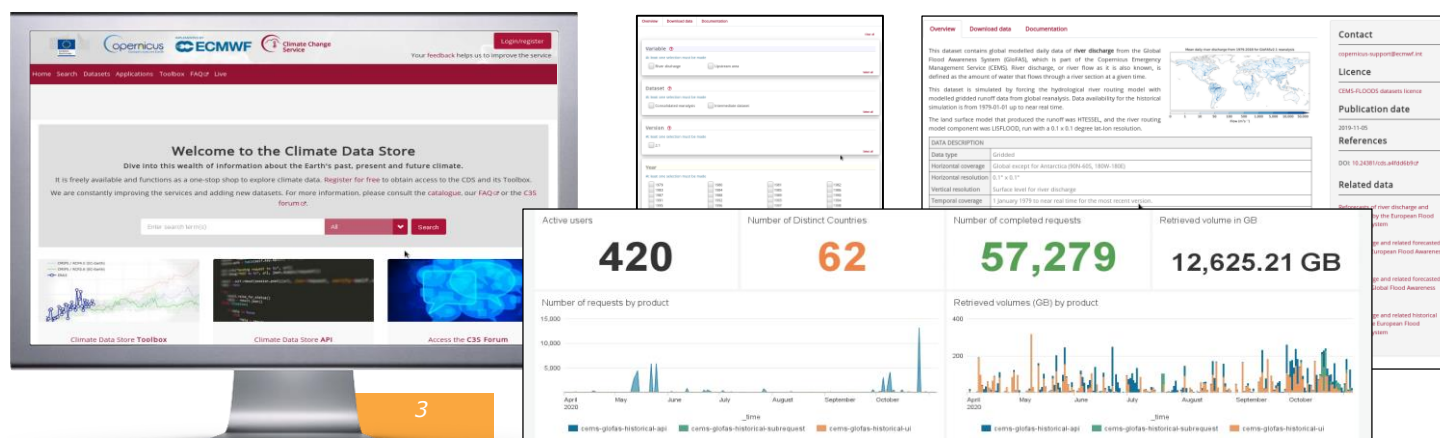
Additional tailored (ftp) data services

- Real time forecasts (river discharge, flood extent, reporting point list) to national and international organisations



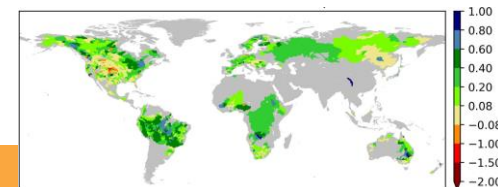
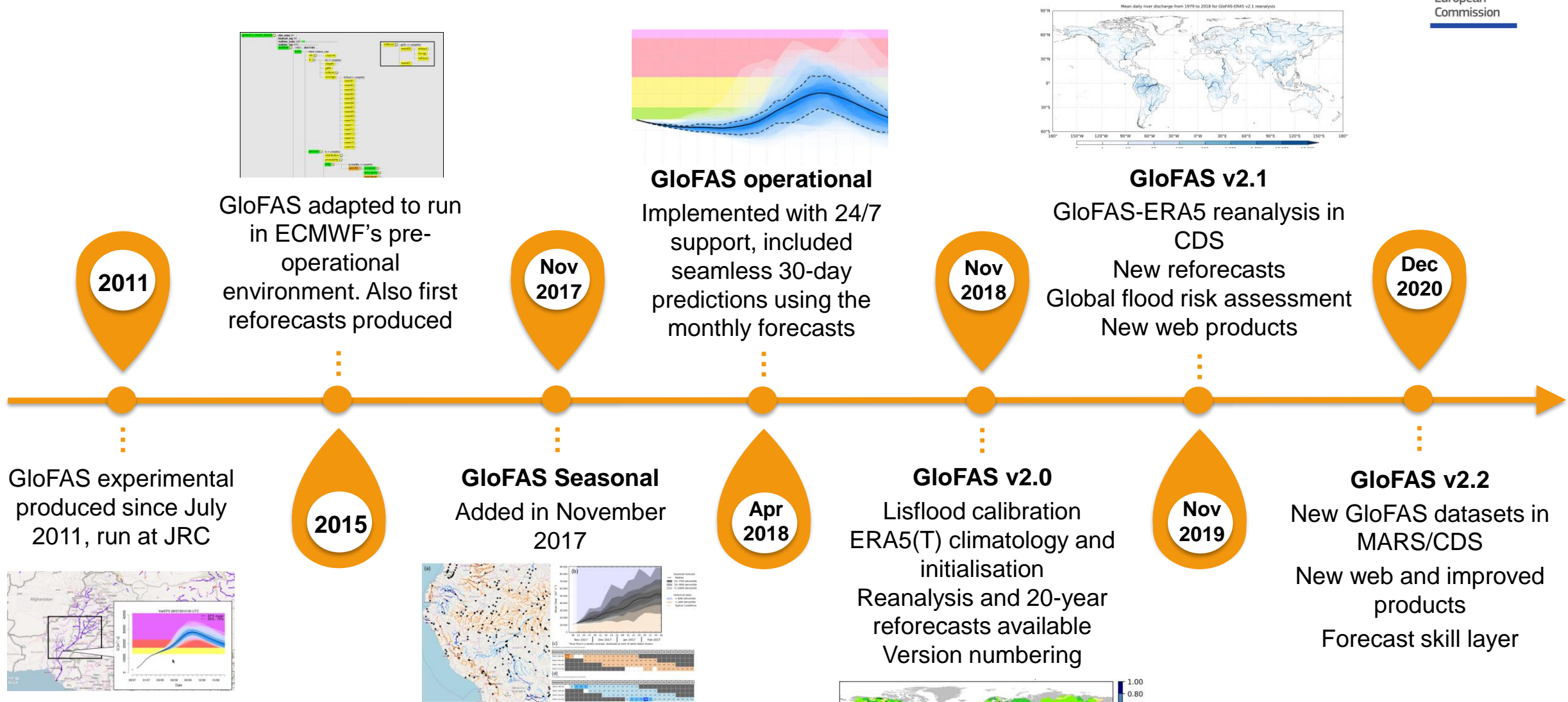
Data access through Copernicus Climate Data Store (CDS)

- <https://cds.climate.copernicus.eu/#!/search?text=glofas>
- From 2 December, 5 GloFAS datasets available (currently 2)





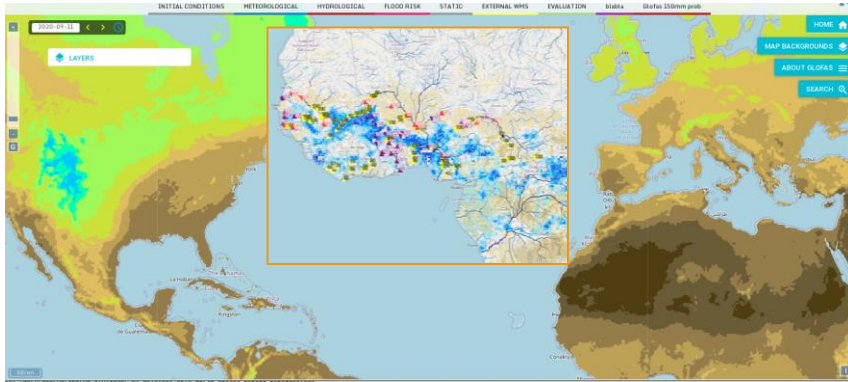
GloFAS system evolution timeline





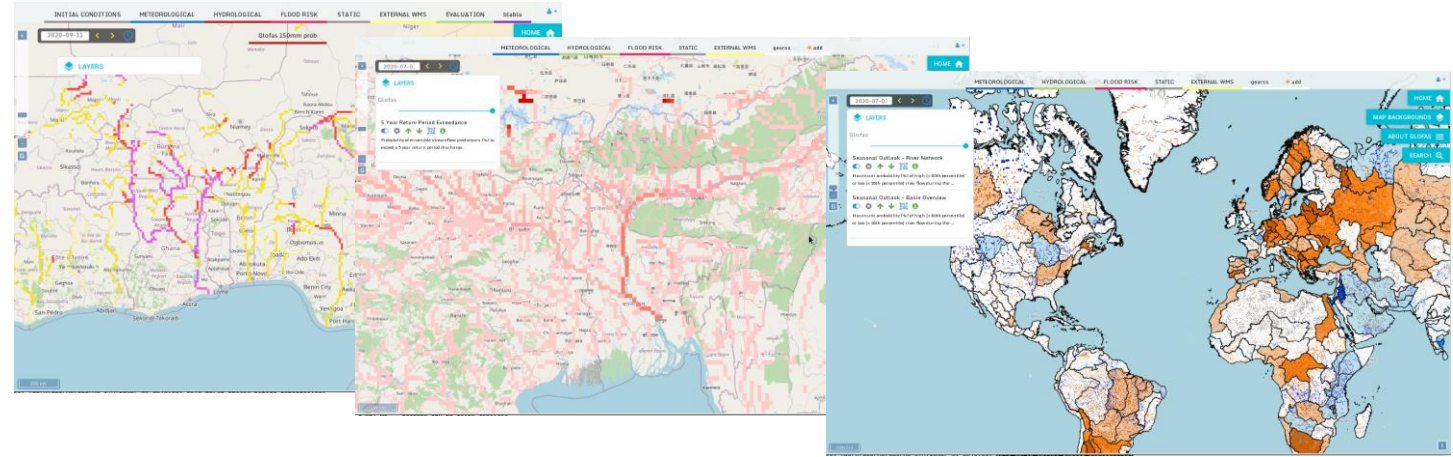
Initial and antecedent conditions

- Precipitation, snowmelt, initial snow cover, soil moisture and 2m temperature
- Anomaly of all those (ERA5-climate)



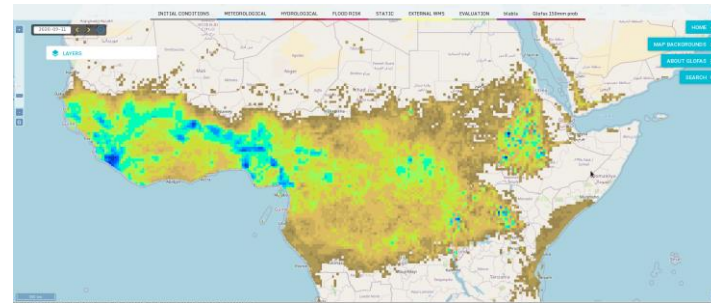
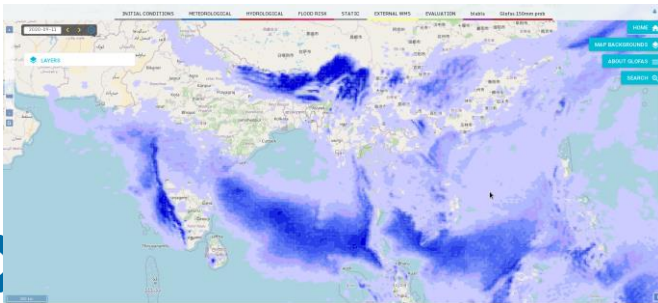
Flood maps

- Flood probability maps (5- and 20-year)
- Categorical flood severity maps for GloFAS 30-day and Seasonal



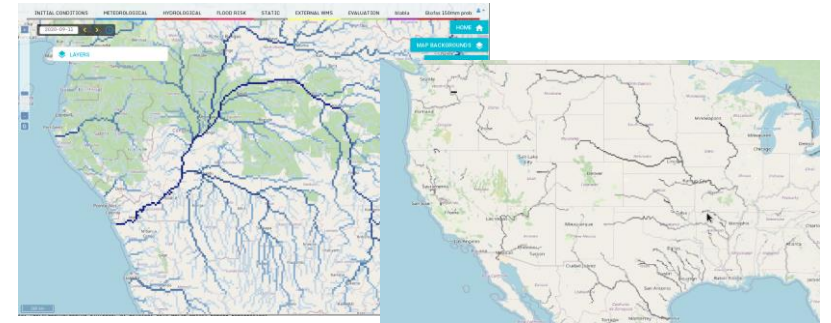
Meteorological forcing maps

- Precipitation 10-day mean and probabilities (50, 150 and 300 mm)
- Animated daily precipitation maps to follow meteorological systems



Ancillary layers

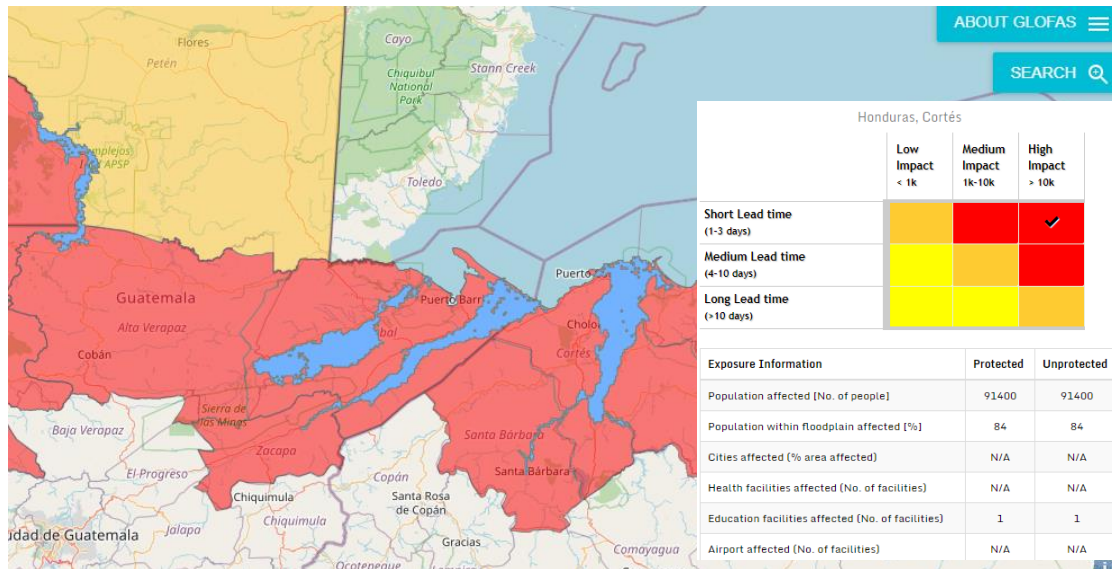
- Upstream area, reservoir impact, major rivers, etc.





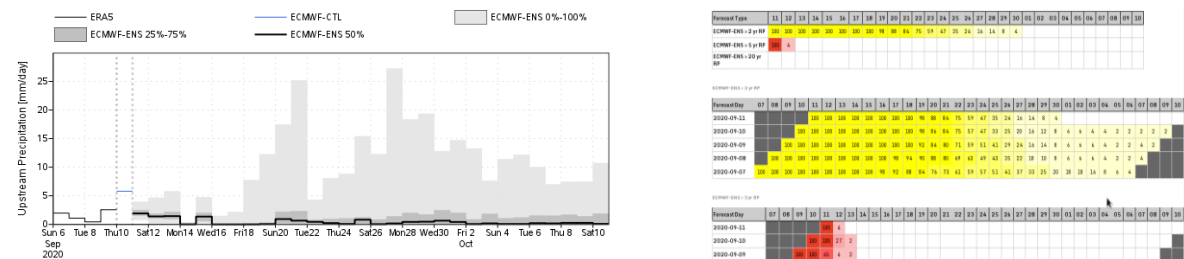
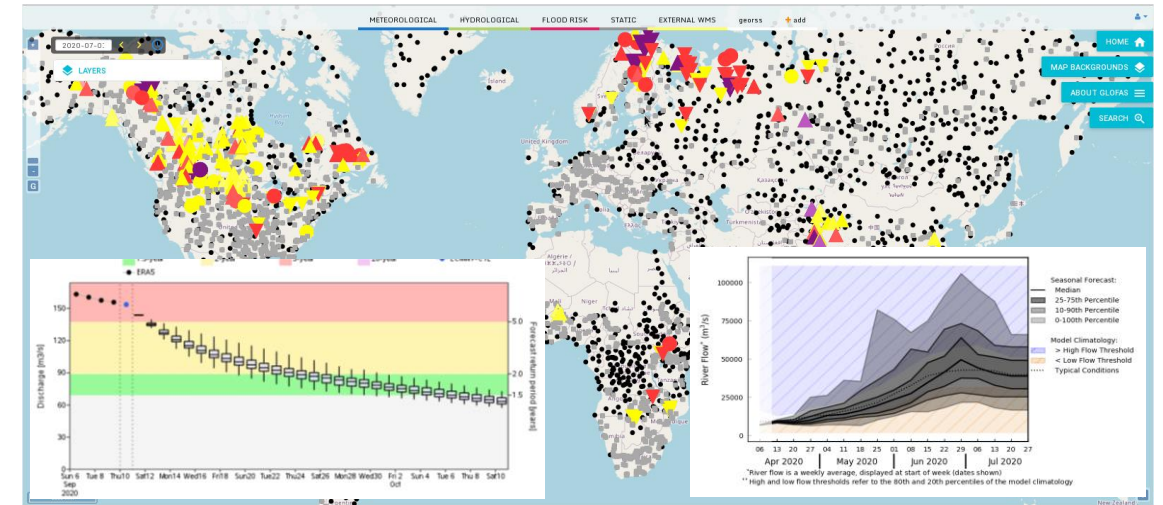
Rapid flood mapping and impact assessment

- **Rapid flood mapping** with estimated flood extent
- **Rapid impact assessment** with exposure and flood event information summary per administration region
- It will also include airports, health and education facilities and impact of flood defences (FLOPROS)



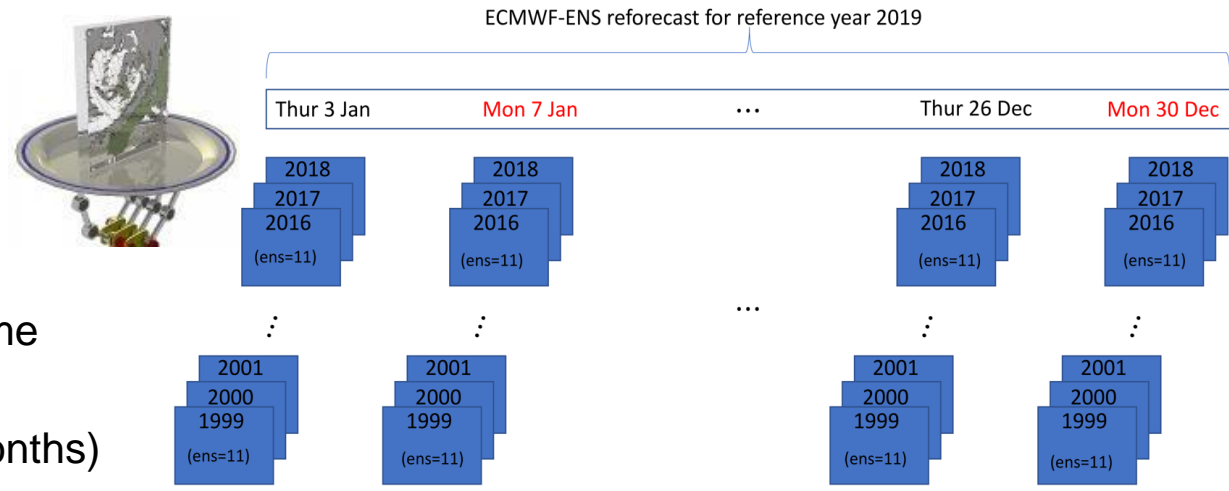
Flood reporting points

- Pop-up window to show various information (30-day and Seasonal)
- River discharge hydrographs and forcing time series graphs for precipitation, snowmelt and 2m temperature
- Forecast consistency tables with probabilities over flood thresholds



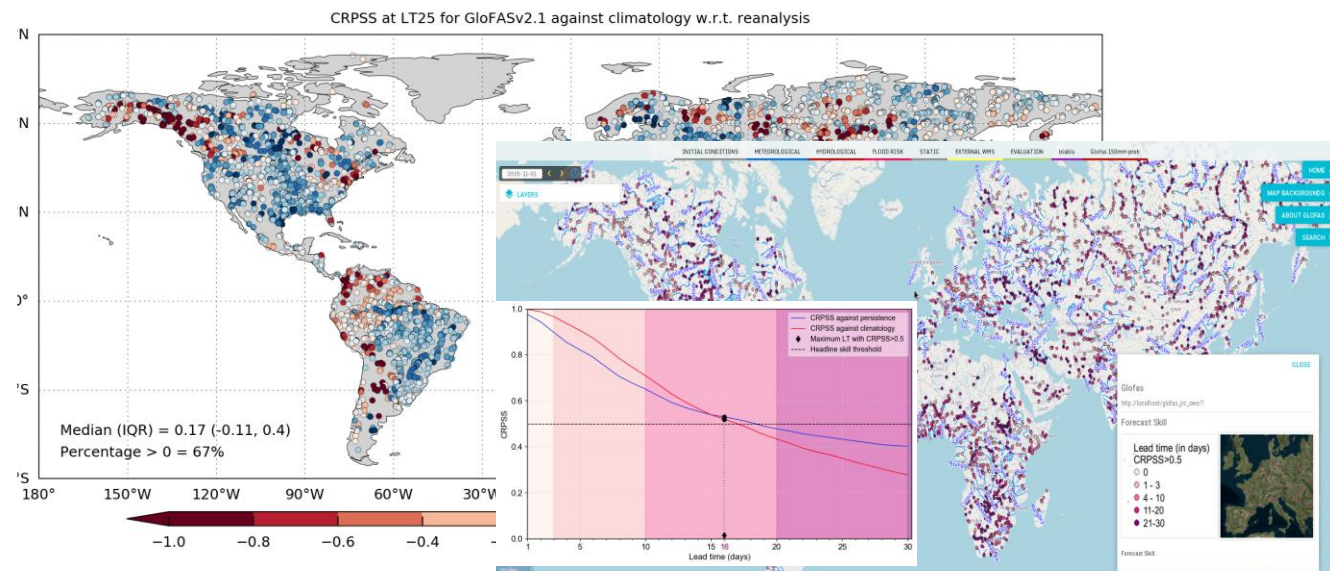
GloFAS data in MARS / CDS

- GloFAS-ERA5 reanalysis (since 5 Nov 2019 in near real time)
- Real time forecasts (since 19 May 2020)
- Seasonal real time forecasts (from v2.2)
- 30-day reforecasts (20 years, Mon/Thu runs, 2080 forecast time series)
- Seasonal reforecasts (1981-2017, monthly runs, out to ~ 4 months)



GloFAS reforecasts and verification

- Unique system
- Very long period (20 years for 30-day and 35+ years for Seasonal)
- Using the same hydrological model and usually two ECMWF IFS versions
- New reforecasts provided for each model version
- Ideal for forecast verification
- **New forecast performance layer** on the GloFAS web

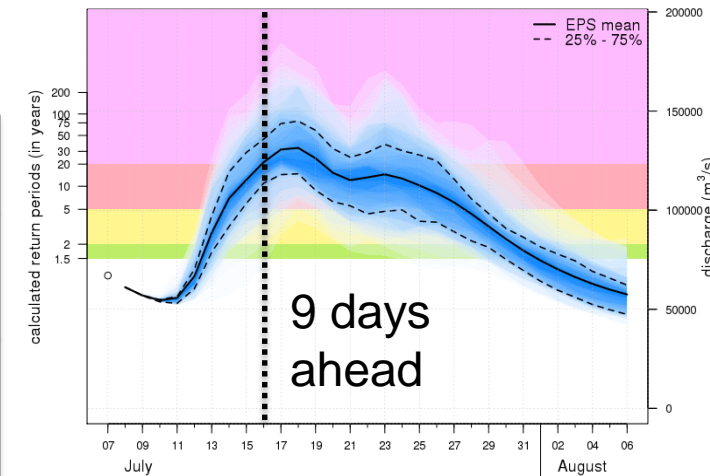
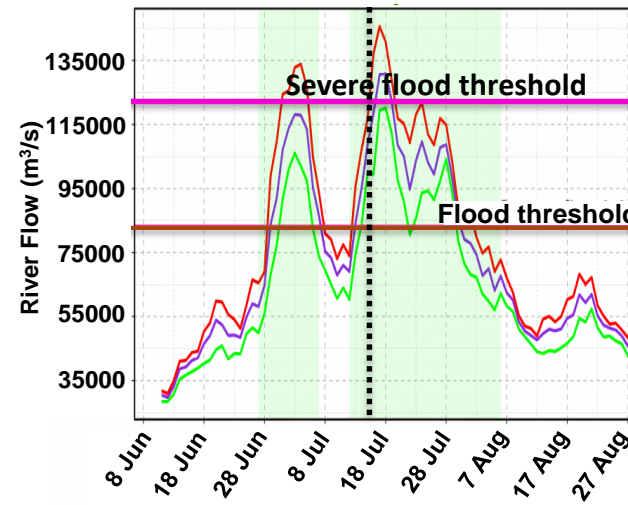
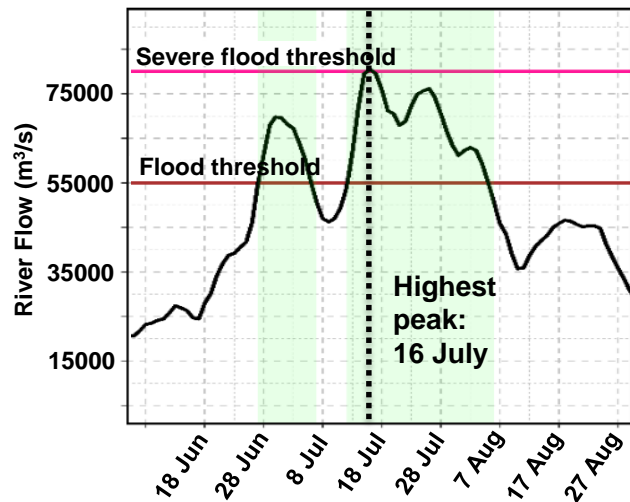
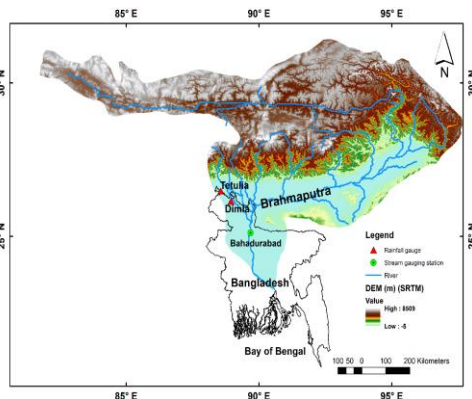
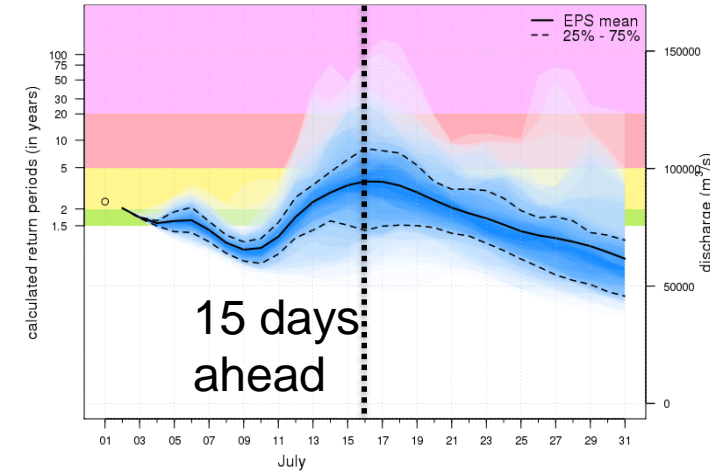




GloFAS for Bangladesh floods Jun-Aug 2020



- Monsoon driven recurring flood season on the Brahmaputra in Bangladesh
- Two major flood waves in summer 2020
- GloFAS is able to indicate the possibility of the flood waves up to 2-3 weeks ahead
- Flood signature has very strong similarity to the observed flow at 10-day lead time



Case study provided by Sazzad Hossain



<http://www.globalfloods.eu/>

<https://cds.climate.copernicus.eu/#!/search?text=glofas>

info@globalfloods.eu

Thank you !

Further reading about GloFAS methodology:

Alfieri et al., 2013: [Global Ensemble Streamflow Forecasting and Flood Early Warning](#), HESS

Hirpa et al., 2016: [The Effect of Reference Climatology on Global Flood Forecasting](#), JoHM

Zsoter et al., 2016: [Building a Multimodel Flood Prediction System with the TIGGE Archive](#), JoHM

Zajac et al., 2017: [The effect of lakes and reservoirs parameterization on global riverflow modeling](#), Geophys. Res. Abstr.

Emerton et al., 2018: [Developing a global operational seasonal hydro-meteorological forecasting system: GloFAS-Seasonal v1.0](#), Geos. Mod. Dev.

Hirpa et al., 2018: [Calibration of the Global Flood Awareness System \(GloFAS\) using daily streamflow data](#), JoH

Zsoter et al., 2018: [How Well Do Operational Numerical Weather Prediction Configurations Represent Hydrology?](#), JoHM

Alfieri et al., 2019: [Range-dependent thresholds for global flood early warning](#), JoH

Zsoter et al., 2020: [Using ensemble reforecasts to generate flood thresholds for improved global flood forecasting](#), Flood Risk Man.

Harrigan et al., 2020: [GloFAS-ERA5 operational global river discharge reanalysis 1979-present](#), ESSD

Zsoter et al., 2020: [Trends in the GloFAS-ERA5 river discharge reanalysis](#). ECMWF Tech. Memo. 871.

Harrigan et al. in review: [Daily ensemble river discharge reforecasts and real-time forecasts from the operational GloFAS](#), HESS