European and Global Flood Awareness Systems

European Commission

EFAS
European Flood Awareness System

GLOFAS
Global Flood Awareness System

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With help from many others

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Copernicus
The European Earth Observation Programme

ECMWF
EUROPEAN CENTRE FOR MEDIUM-RANGE WEATHER FORECASTS

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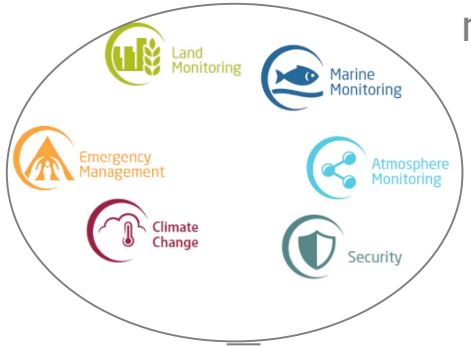
Copernicus
Europe's eyes on Earth

Service Overview

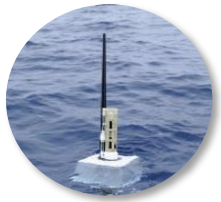
Copernicus
Europe's eyes on Earth

6 services use Earth Observation data to deliver …

Sentinels & Contributing Satellite Missions



In-situ measurements



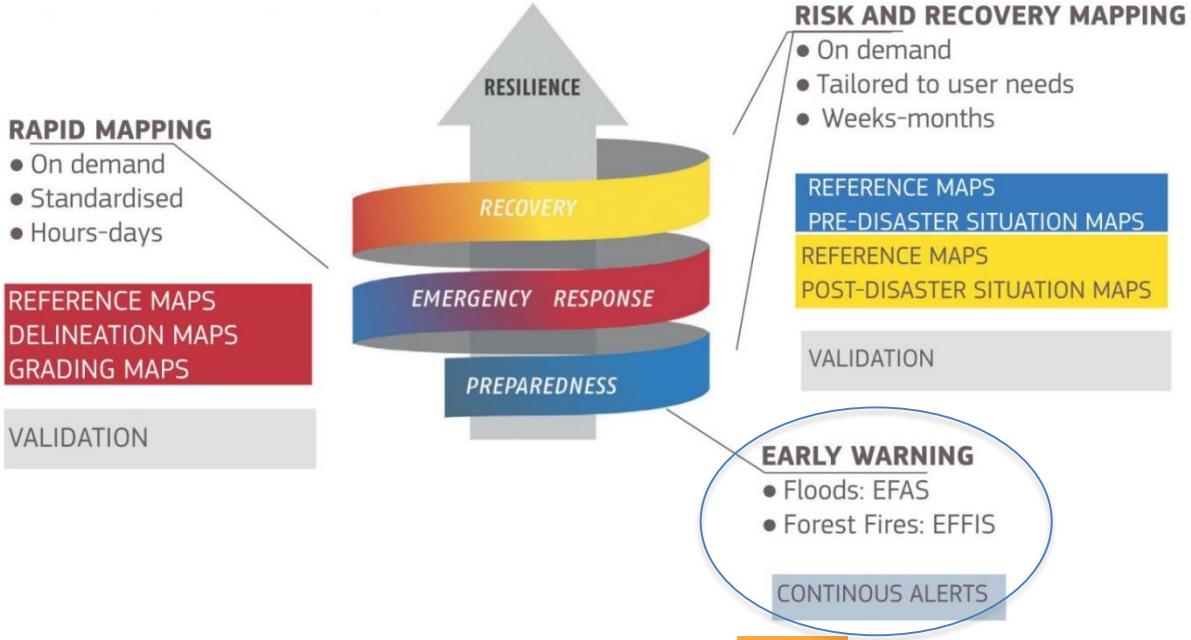
… added value products

Copernicus Emergency Management Service

EC Copernicus Emergency Management Service CEMS set-up to "*Provides information for emergency response in relation to different types of disasters as well as prevention, preparedness, response and recovery activities*."

EFAS, European domain operational since in 2012, pre-operational since 2003

GloFAS, Global domain operational from March 2018, pre-operational since 2011



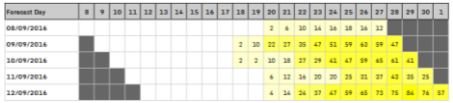
CEMS-Flood Vision

Early warning for preparation of aid assistance

European/World-wide comparable information

Complement National/regional services

EFAS
European Flood Awareness System

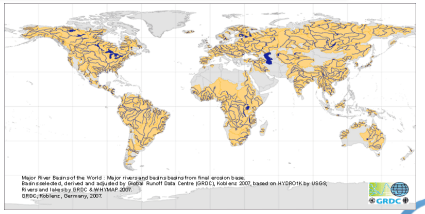


GLOFAS
Global Flood Awareness System

Knowledge transfer & exchange

Support international organisations

Improved data sharing



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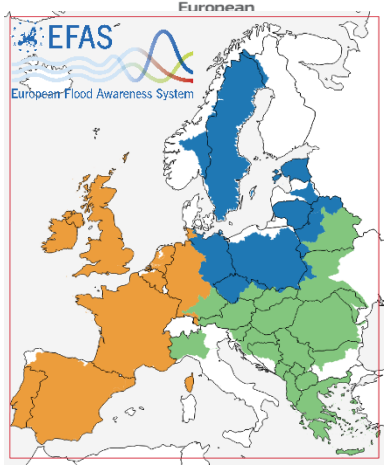
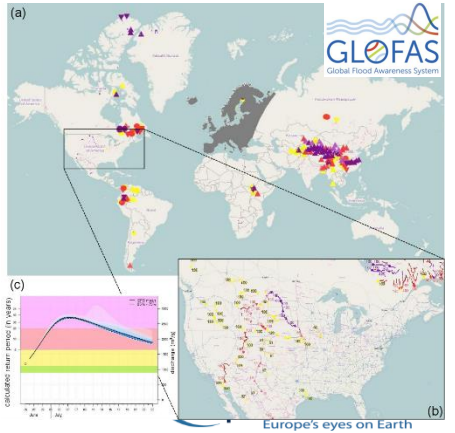
EFAS/GloFAS at a glance

- Early probabilistic flood warnings (restricted in Europe)
- Transboundary system

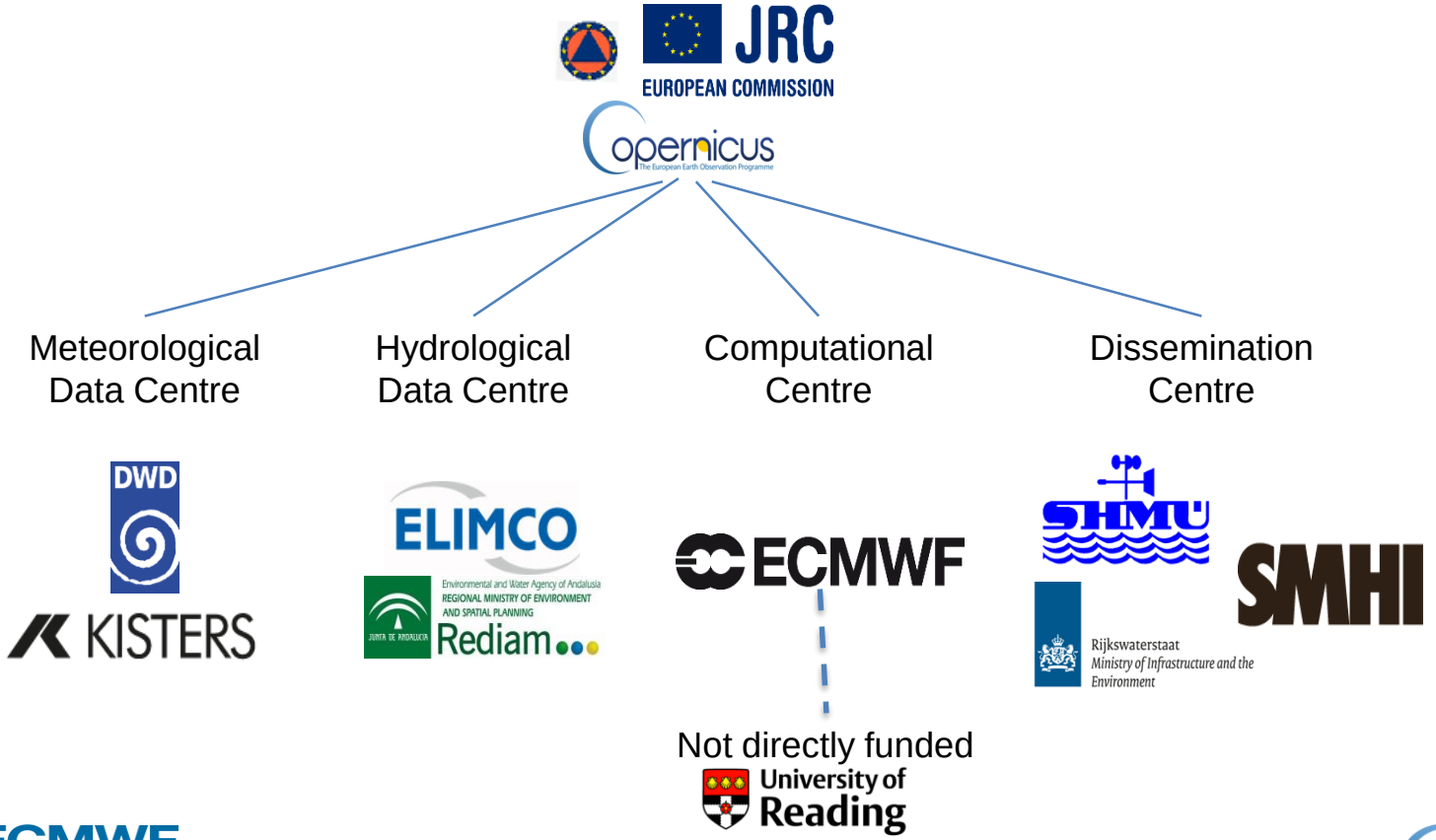
- In Europe (EFAS), ~ 70 partners (restricted) who provide:
  - Observations
  - Feedback on warning performance
  - Service delivered by the JRC and 4 centres

- In the world (GloFAS)
  - Over 1600 registered users
  - Special partners providing data
  - Service delivered by JRC and ECMWF



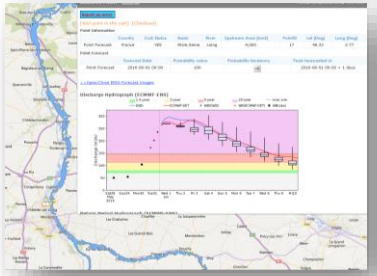


CEMS-Flood Structure and Governance



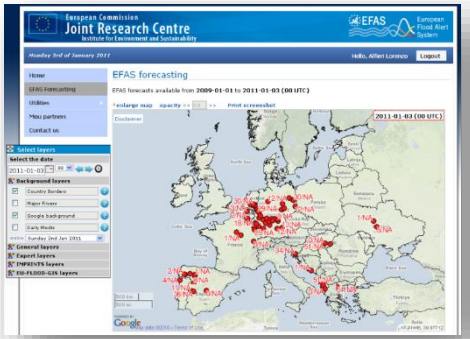
CEMS-Flood-Comp Responsibilities

Produce timely probabilistic forecasts

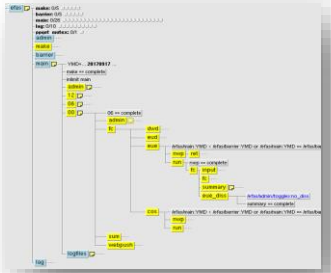


Regularly assess forecasts performance

Publish results on web interface accessible 24/7



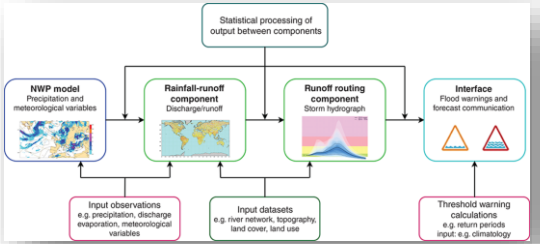
Maintain state-of-the-art production and test systems

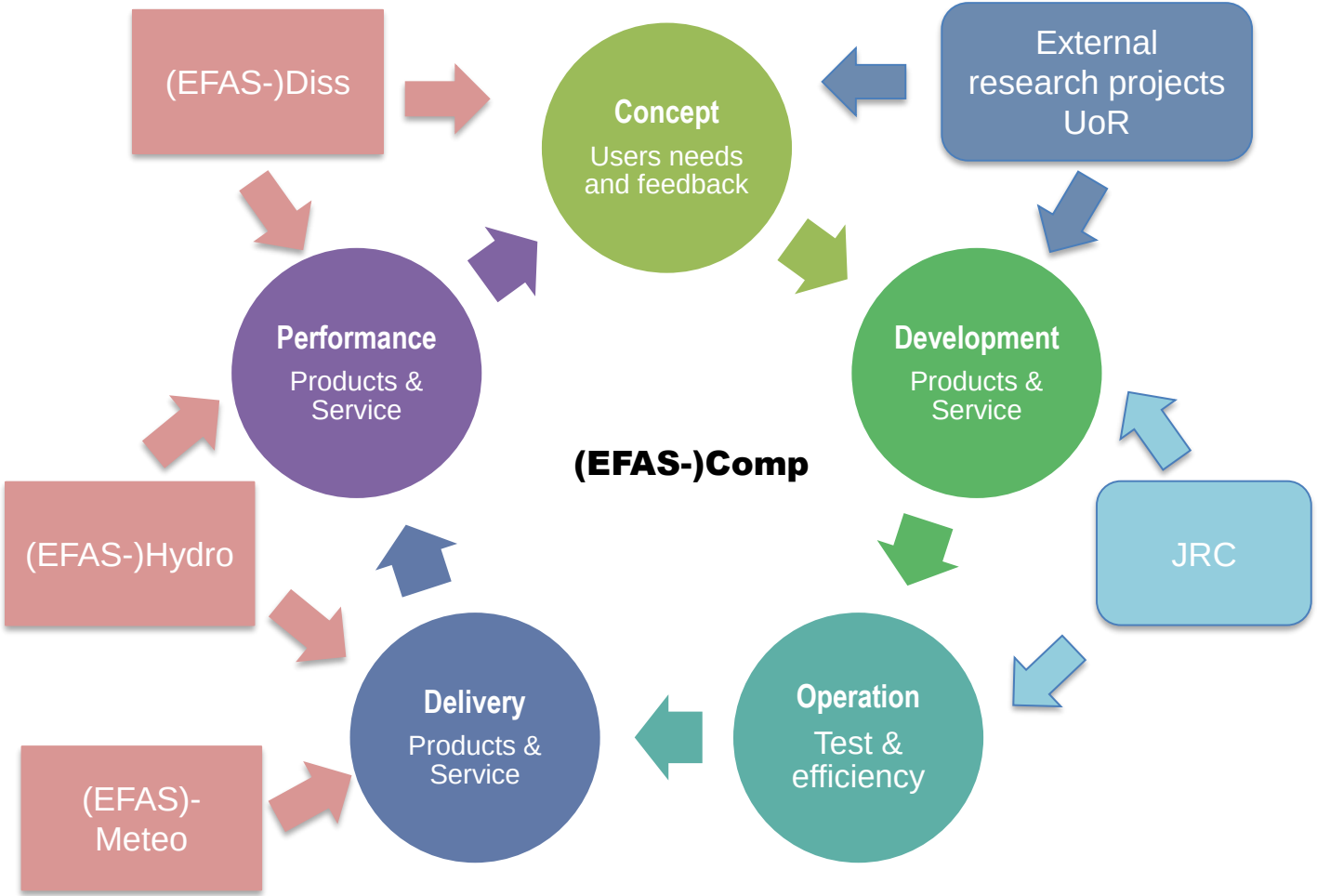


Maintain quality assurance logs

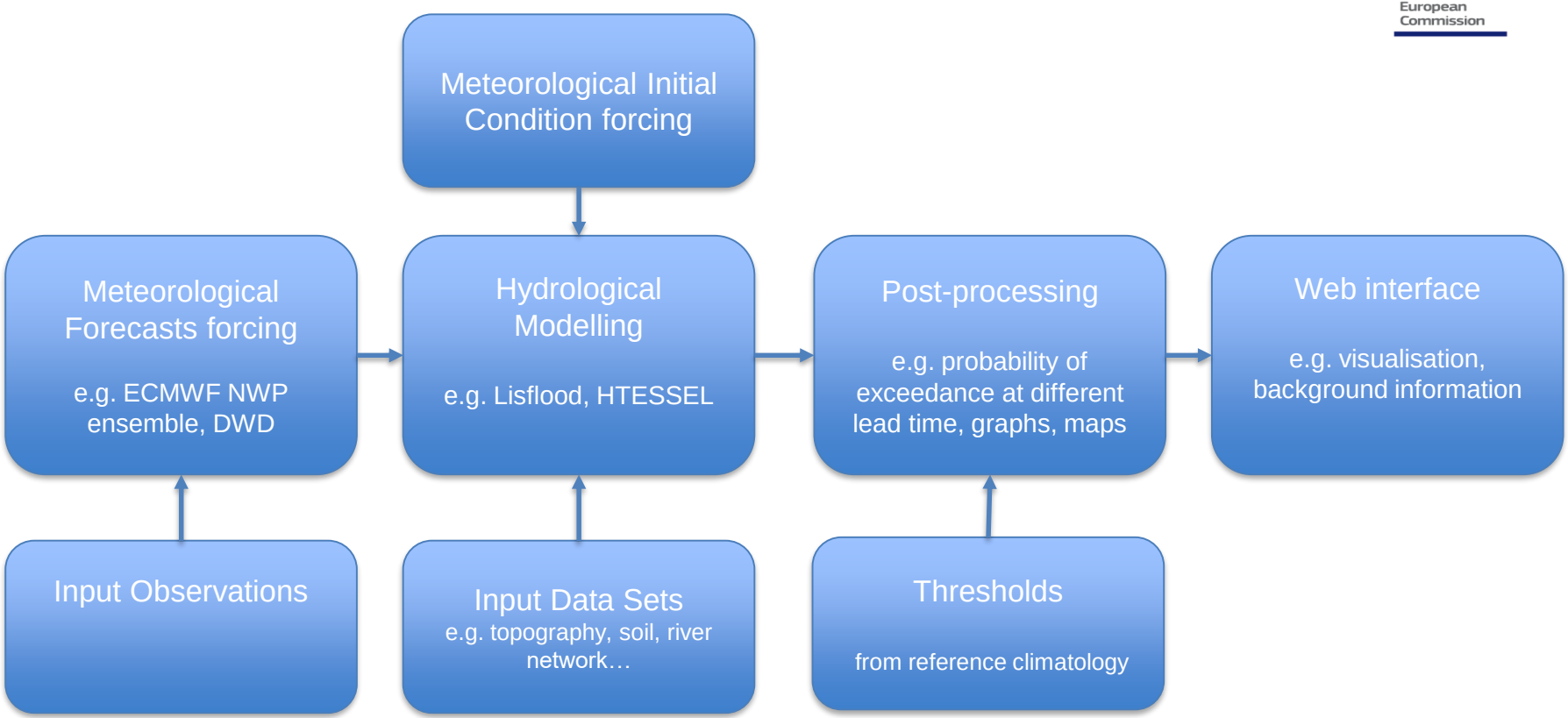
JIRA
Bitbucket
Confluence

Develop and assess feasibility of new technics & science

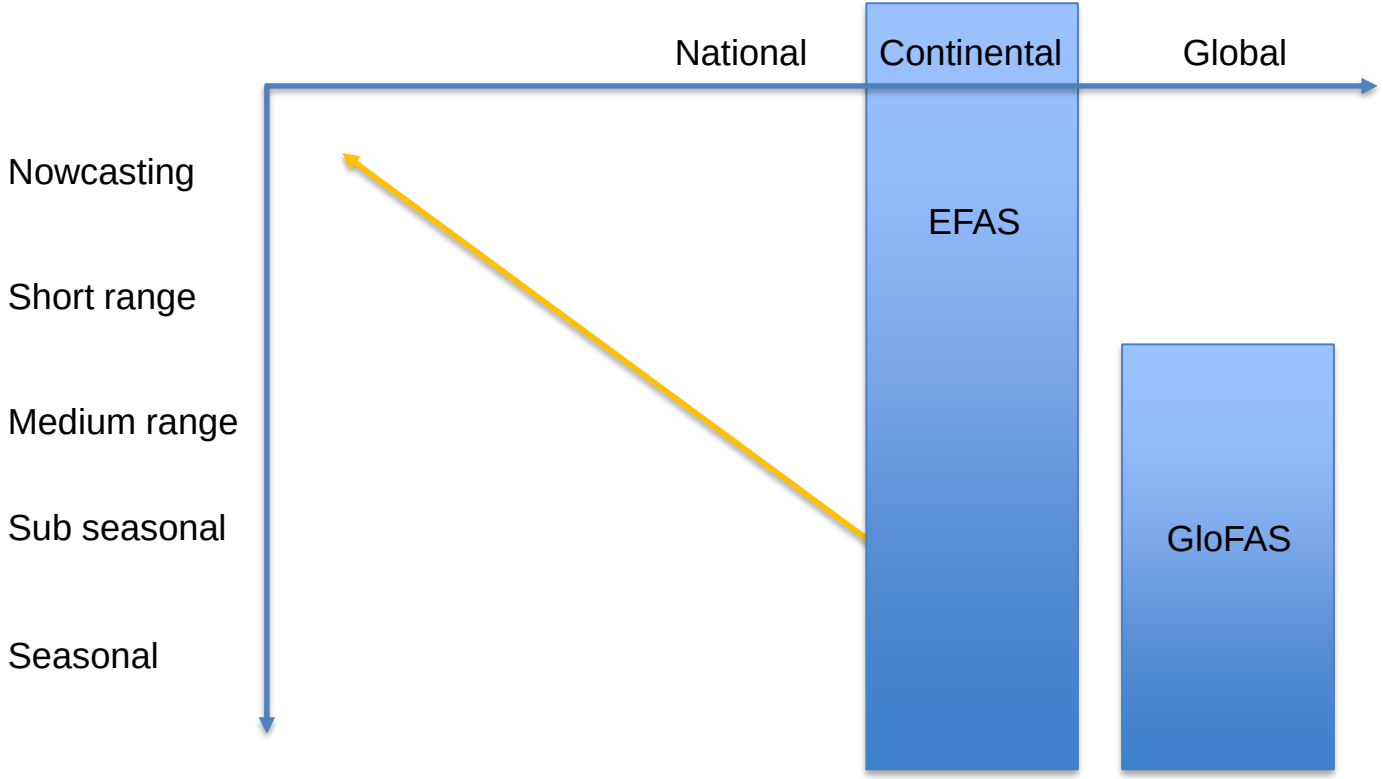



(EFAS-)Diss
Concept
Users needs and feedback
External research projects UoR
Performance
Products & Service
Development
Products & Service
(EFAS-)Comp
(EFAS-)Hydro
JRC
Delivery
Products & Service
Operation
Test & efficiency
(EFAS)-Meteo

Hydrological forecasting modelling overview



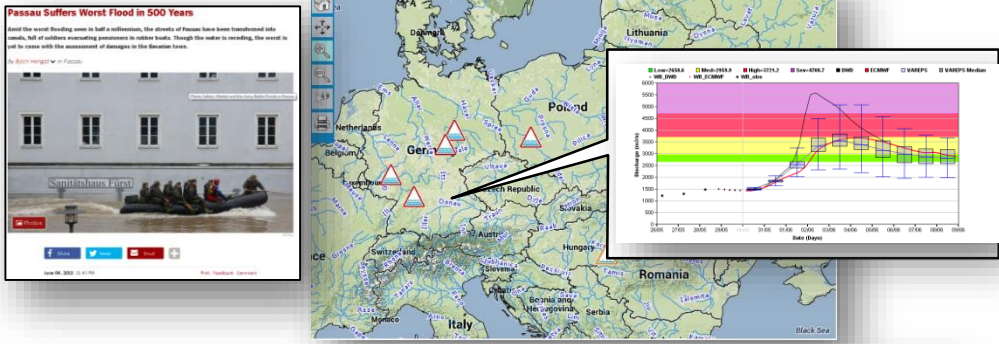
CEMS-Flood Space/time Context



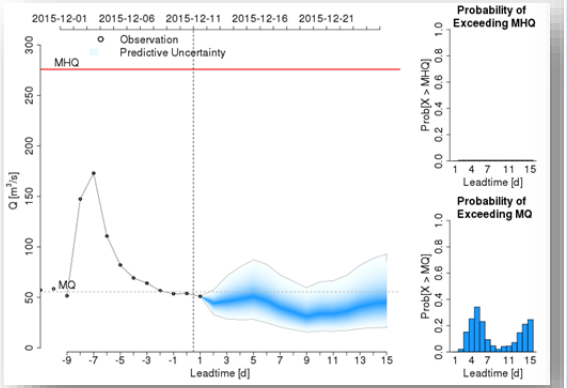
EFAS Medium Range - Flood Warning and Alerts

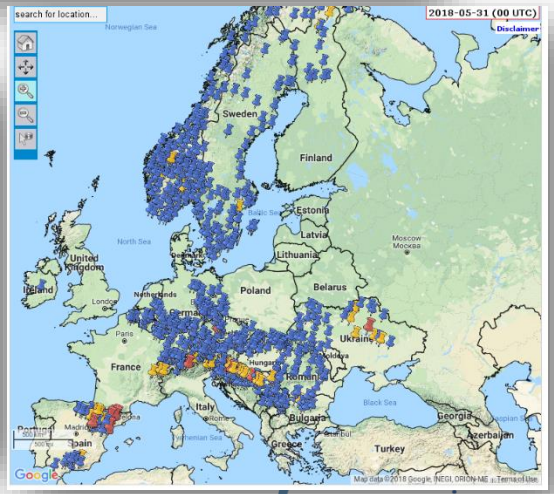
- **Flood summary layers**
  - European coverage; Twice daily up to 15 days
  - Different Flood probability
  - EFAS active information/ notifications (activated by EFAS duty forecaster)

Donau at Passau, Germany 30 May 2013



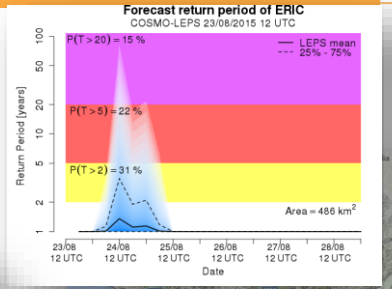
- **Post-processed flood forecasts layers**
  - Over 500 points over Europe; produced twice daily up to 15 days
  - Statistical correction where real-time observed discharge is provided

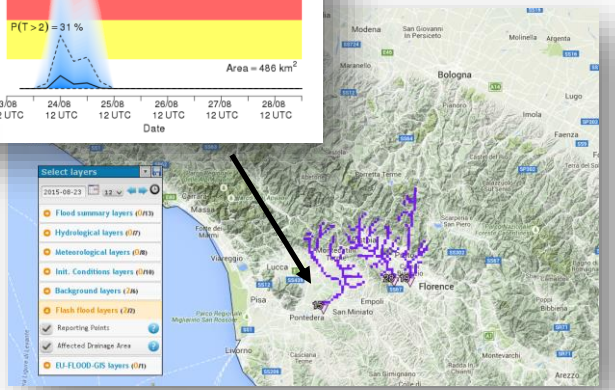




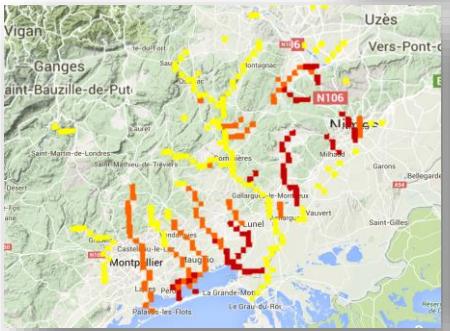
EFAS Short Range - Flash Flood

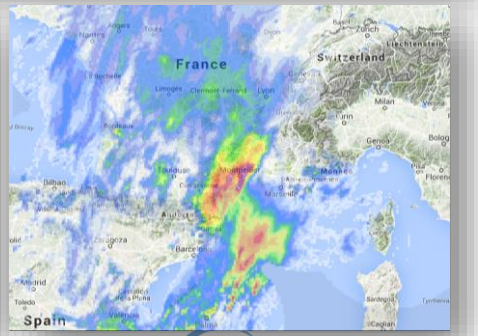
- **Flash Flood alert layer**
  - European coverage; Daily up to 5 days
  - Probabilistic forecasts for given return periods, affected areas and accumulated runoff
  - Catchment size up to 2000km^2





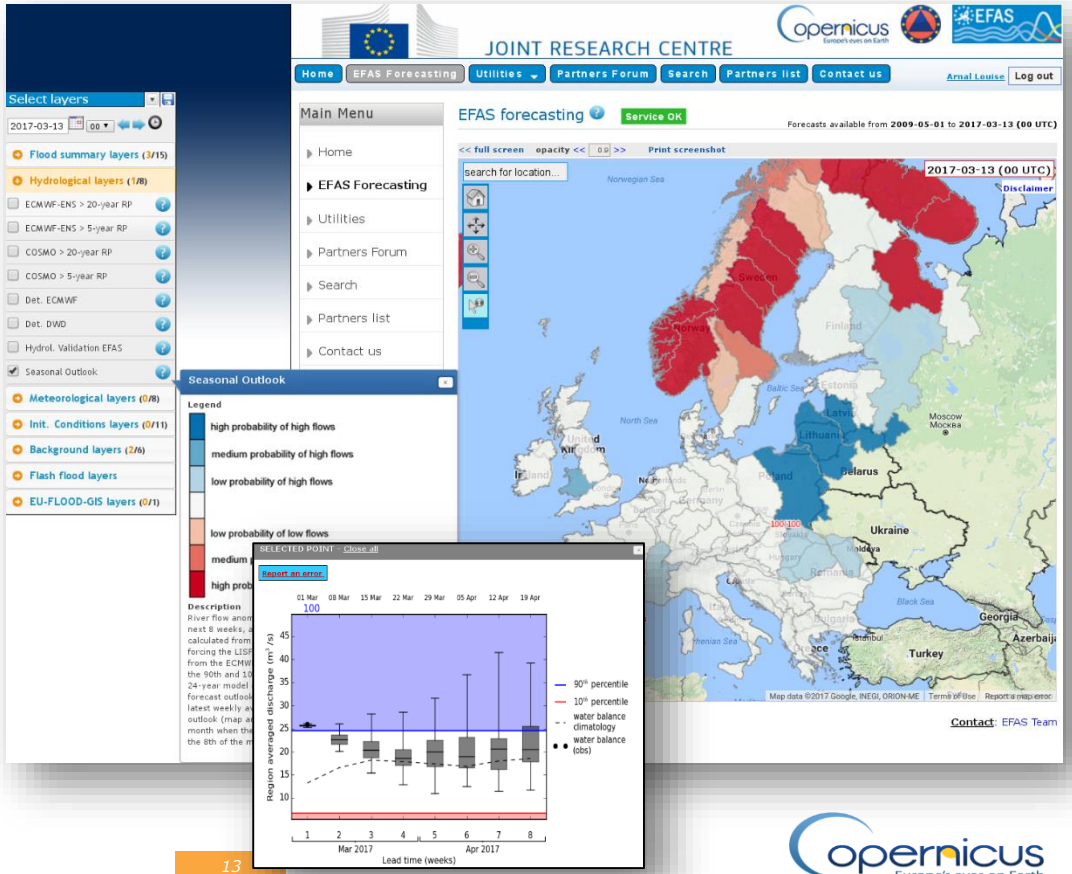
- **Nowcasting layer**
  - Opera radar coverage; every 15mn up to 3 hours
  - Precipitation field image and flash flood indices on 1-km river network





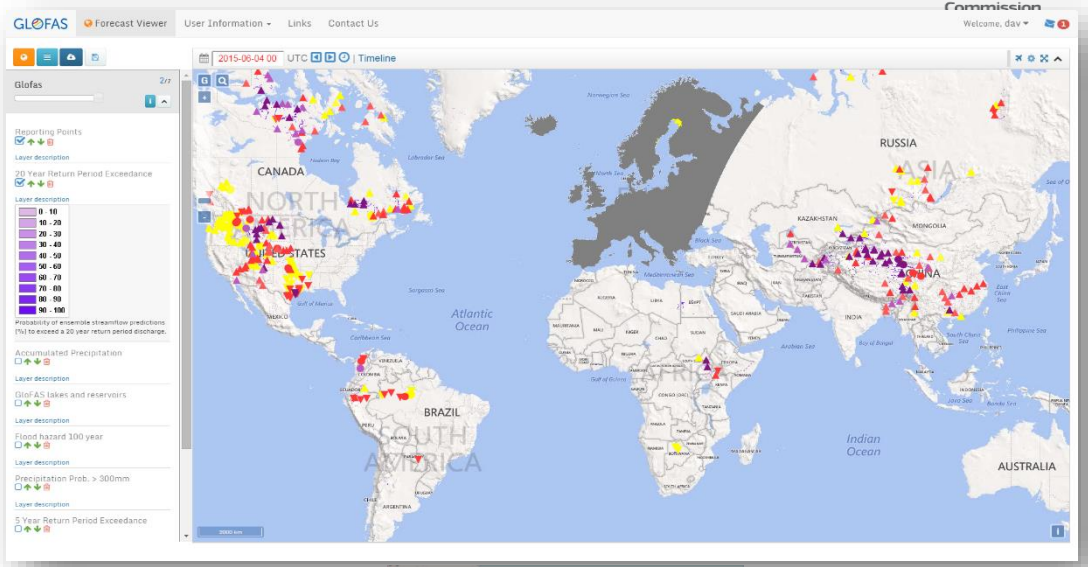
EFAS Seasonal Range - EFAS-Seasonal

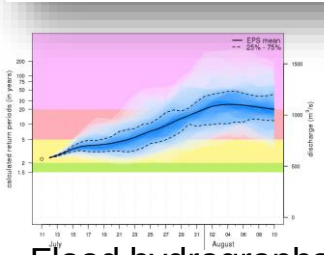
- **Seasonal outlook layers**
  - European coverage, 10th month up to 8 weeks
  - Catchment-based probability of high/low flow occurrence
  - Weekly averaged hydrographs with ensemble prediction



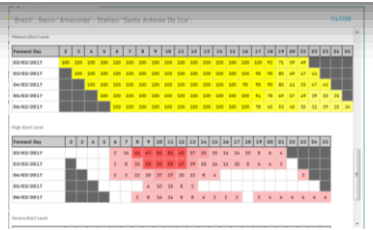
GloFAS medium to extended range: 30-days flood forecasts

- **Flood Forecast Layers**
  - Worldwide (except Europe); Daily up to 30 days
  - Probabilistic forecasts
  - Flood reporting points and river network for given return periods
  - Flood hydrographs and persistence diagrams
  - Static flood hazard maps





Flood hydrographs

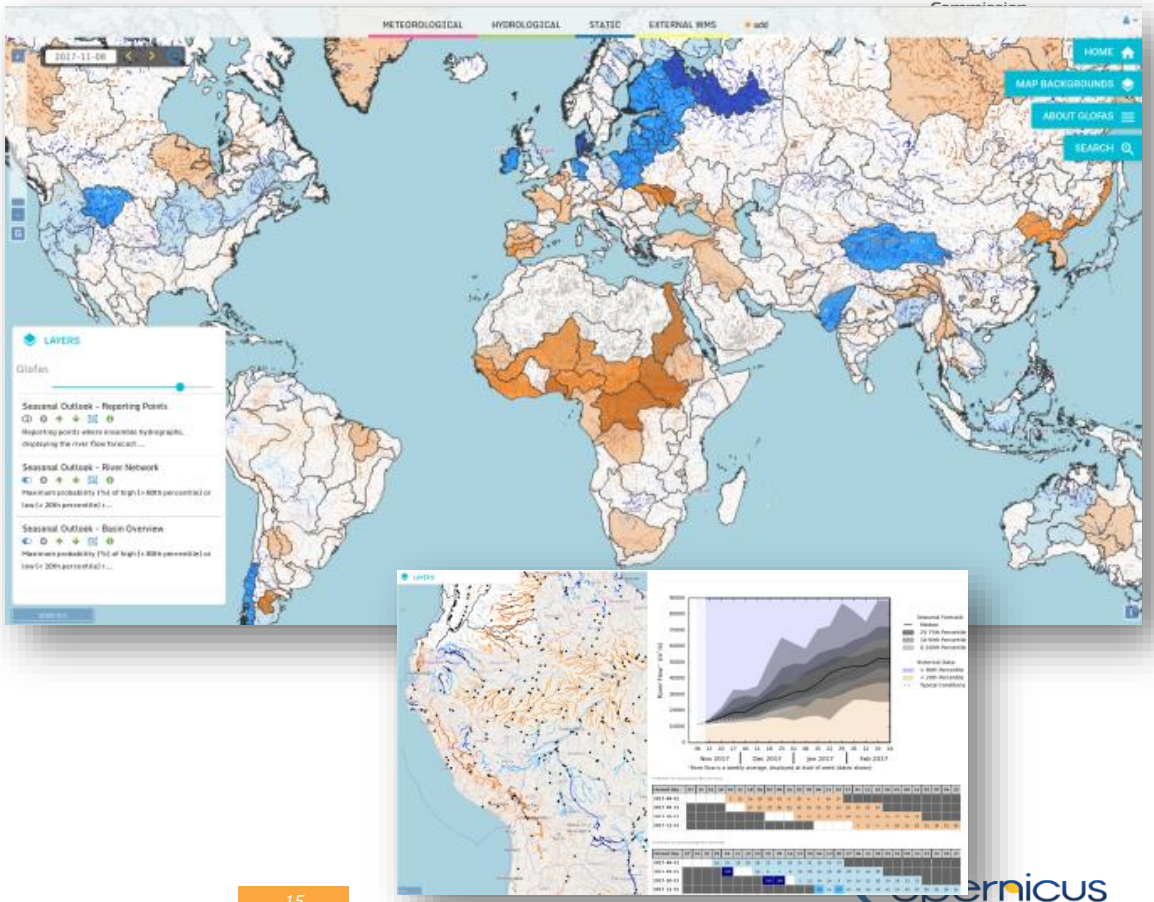


Persistence diagrams

Flood Hazard Maps (static)

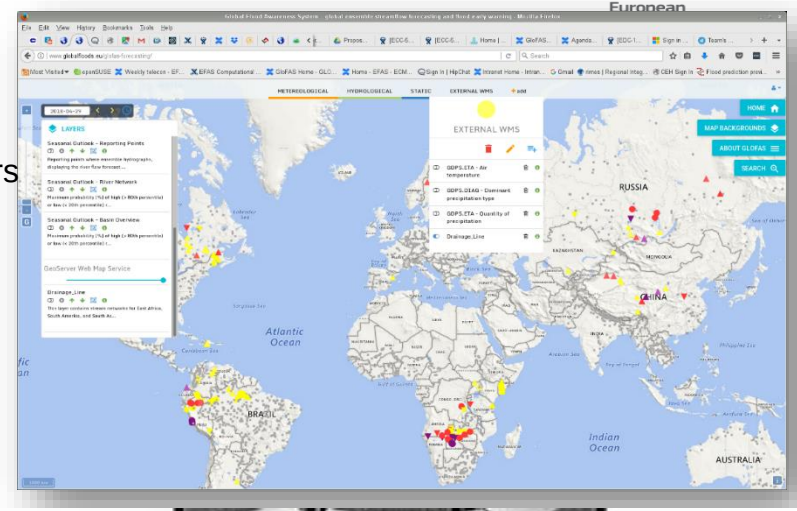
GloFAS seasonal range: GloFAS seasonal

- **Seasonal Outlook Layers**
  - Worldwide (except Europe); Monthly up to 4 months
  - Catchment-based averages and river networks probability of high/low flow occurrence
  - Weekly averaged hydrographs and persistence diagrams



Web interface & Data Access

- Web Interface
  - Forecast viewer for registered users (for all GloFAS; eligible partners EFAS)
  - Quick overview of hydro-meteorological outlooks, multiple layers
  - Search and zoom on locations
  - External Web Mapping Services for users to import additional layers to viewer
  - Background information, use case and video tutorials
  - In-focus news and twitter feeds

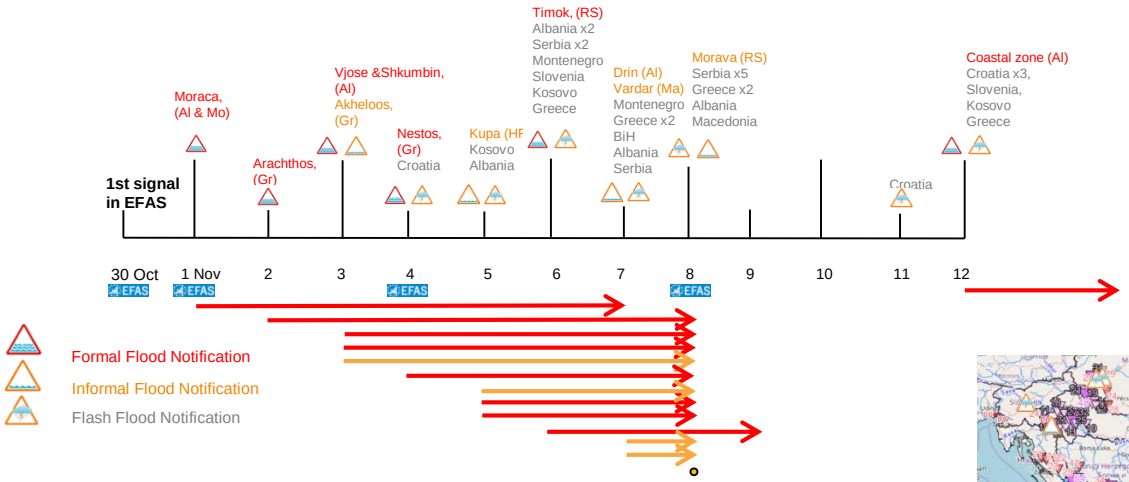


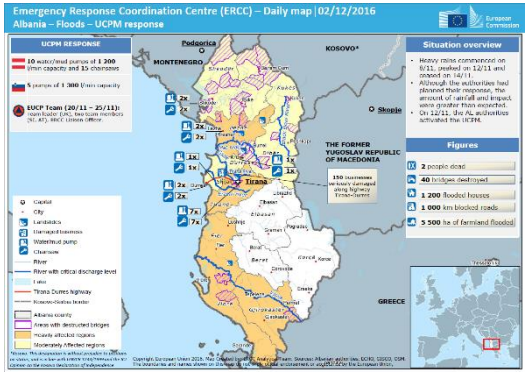
https://www.efas.eu

www.globalfloods.eu

- Data Access
  - Real-time forecasts, climatology, past-forecasts (all GloFAS; eligible partners EFAS)
  - On-demand ftp service
  - Soon into ECMWF MARS archive

EFAS in action: Balkan Floods 8-14 Nov 2016





8 Formal Notifications (Albania, Greece, Montenegro, Serbia)

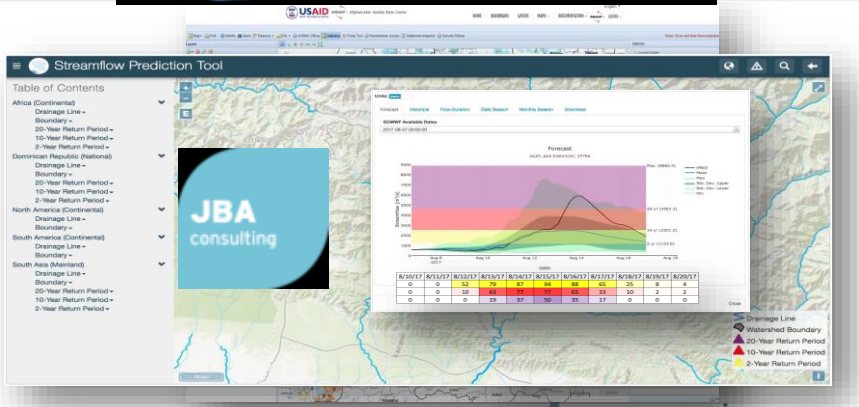
5 Informal Notifications (Albania, Croatia, Greece, Macedonia, Serbia)

13 Flash flood Notifications (Albania, Bosnia&Hercegovina, Croatia, Greece, Kosovo, Macedonia, Montenegro, Serbia, Slovenia

Collaborations and outreach

- Automatic ftp feeds for selected reporting points
  - Red Cross Red Crescent Climate Centre
  - Centro Nacional de Monitoramento e Alertas de Desastres Naturais (Brazil)
  - Flood Forecasting Centre of Bangladesh
  - UCAR (201 stations across Asia)
  - JBA consulting (India / Brahmaputra)
- Afghanistan Spatial Data Centre / IMMAP
  - GloFAS forecasts included in flood forecast layers
- US Army Engineer Research and Development Centre
  - Locally downscaled forecasts
- Thethys Streamflow Forecast Platform
  - Locally downscaled forecasts
  - Products available through WMS

Organisation	org_acronym	2016	2017	2018	Grand Tot
University - California University of Pennsylvania	EDU-CALU	21	2905	465	3391
Information Management and Mine Action Programs	iMMAP	563	2323	567	3453
University - Kabul University	EDU-KU		1723	32	1755
Ministry of Urban Development and Housing	MUDH		1174	55	1229
Save the Children Federation International	SCI	5	1027	31	1063
Afghanistan National Disaster Management Authority	ANDMA	200	950	2332	3482
University - Kabul Polytechnic University	EDU-KPU	75	861	303	1239
World Food Program	WFP	11	772	79	862
University	EDU-UNI		411		411
Ministry of Rural Rehabilitation and Development	MRRD	5	226	17	248
Private	Private	1	200	85	286
Danish Committee for Aid to Afghan Refugees	DACAAR		199	4	203
International Organization for Migration	IOM	5	189	667	861
coordination of Afghan relief	CoAR	8	170	40	218
Aga Khan Agency for Habitat				6	174
United Nations Human Settleme				95	260
International Medical Corps				29	231
Shelter For Life International				73	221
Afghan Social Welfare Developn					128
Caritas Germany				110	236
Afghan Red Crescent Society				23	182



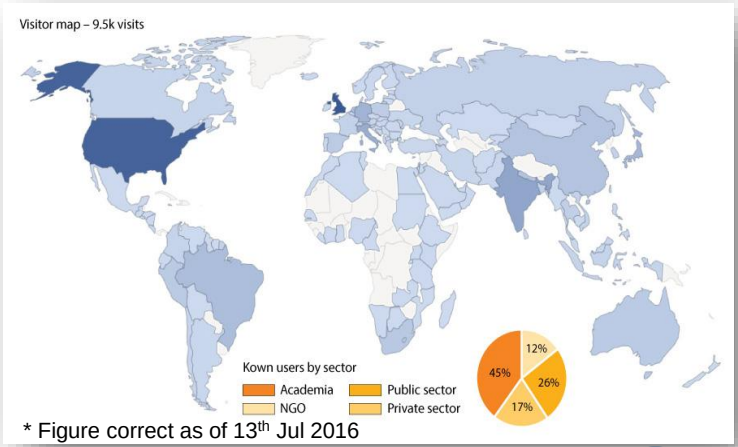
GloFAS Capacity Building – Peru case study

- Working alongside the ‘Forecast-based Financing’ Pilot Project team
  - Based in the Peruvian Red Cross Office
- Flood Forecasting in North Peru is high priority because of El Niño
- Capacity building & GloFAS training with SENAMHI hydrologists

  (the Peruvian meteorological and hydrological agency)
- Setting up Standard Operating Procedures for actions based on a forecast
- GloFAS forecasts will be used as a trigger for early action from the Red Cross in Bajo Piura, a highly vulnerable district on the River Piura

EFAS/GloFAS Users Community

- Annual EFAS partners meetings
- GloFAS co-developments e.g. Reading University (UK), RIMES (South East Asia), Cemaden (Brazil)
- Community of Users Workshops



* Figure correct as of 13th Jul 2016

Thank you

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