On-demand mapping

Rapid Mapping

Risk and Recovery Mapping

Early warning and monitoring

Floods

Fires

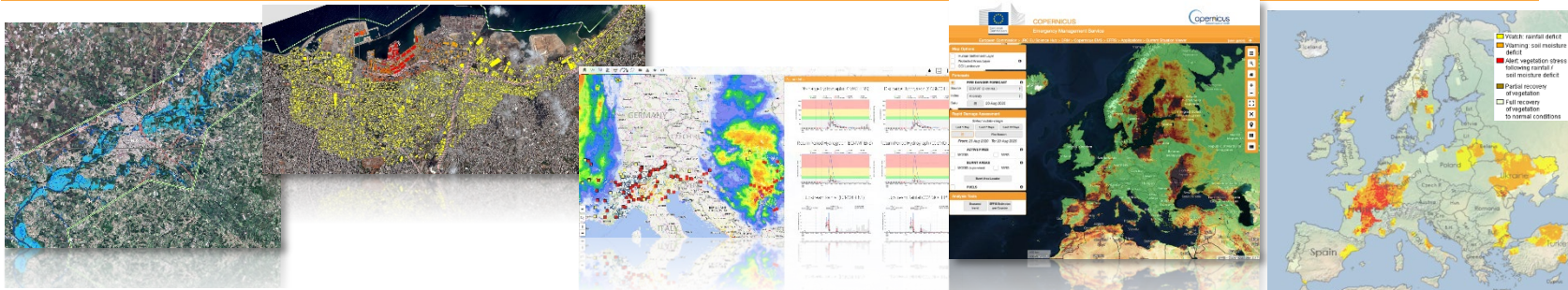Droughts

Emergency Management Service

Water scenarios for Copernicus Exploitation (Water-forCE) ,
15 March 2021

Copernicus
Europe's eyes on Earth

European Commission

Emergency Management

On-demand mapping

Rapid Mapping

Risk and Recovery Mapping

Early warning and monitoring

Floods

Fires

Droughts

- Addresses natural and man-made disasters **globally** supporting **all phases of DRM**
- Provides **earth-observation**, **model** & **in-situ** based disaster management information
- Operational since 2012
- DG JRC is responsible for managing of CEMS and its further evolution (e.g. model improvements, new products, etc.)

Emergency Management

CEMS on-demand Mapping

→ Authorised user needs to request product

- **Rapid Mapping**: fast provision of products (hours to a few days) with the aim to support emergency response

- **Risk and Recovery Mapping**: products available usually within a few weeks with the aim to support risk prevention and recovery efforts

Water-related products:
- Flood extent and impact maps
- Historical flood delineation
- Tsunami risk assessment
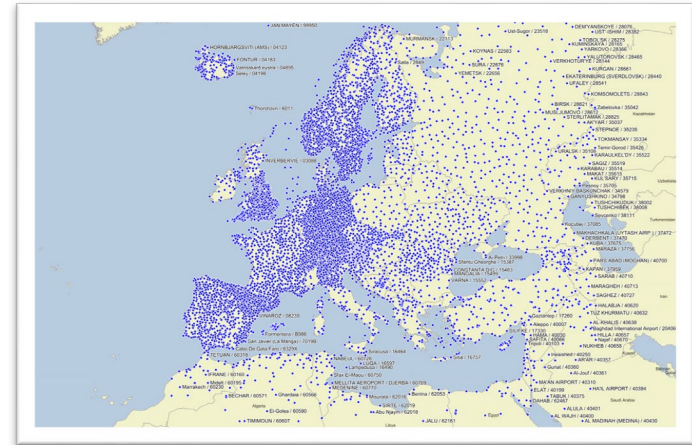
Emergency Management
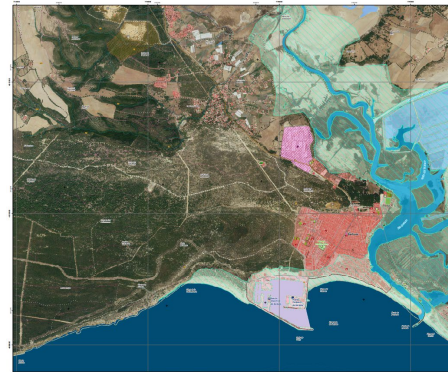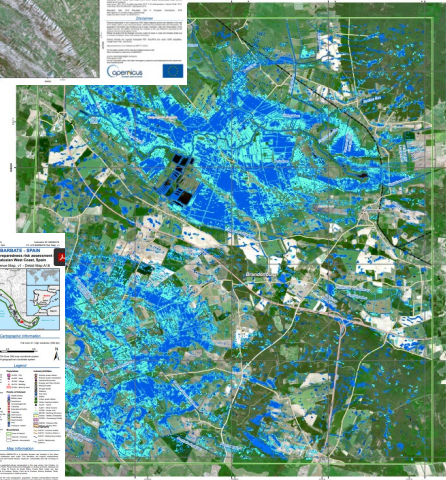
CEMS in-situ data collection centres

- **Variables collected (NRT and historic)**:
  - Hydro: **river discharge** and **water level**
  - Meteo: precipitation, temperature, solar radiation, vapor pressure, wind speed
- 68 hydrological and 22 meteorological **data providers**
- 3,503 hydrological and 44,641 meteorological **stations**
- Currently only for **Europe**
- Hydrological data collection to be expanded to **global** level and new variables (reservoir related)
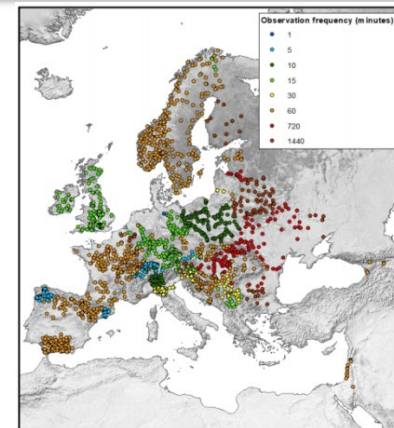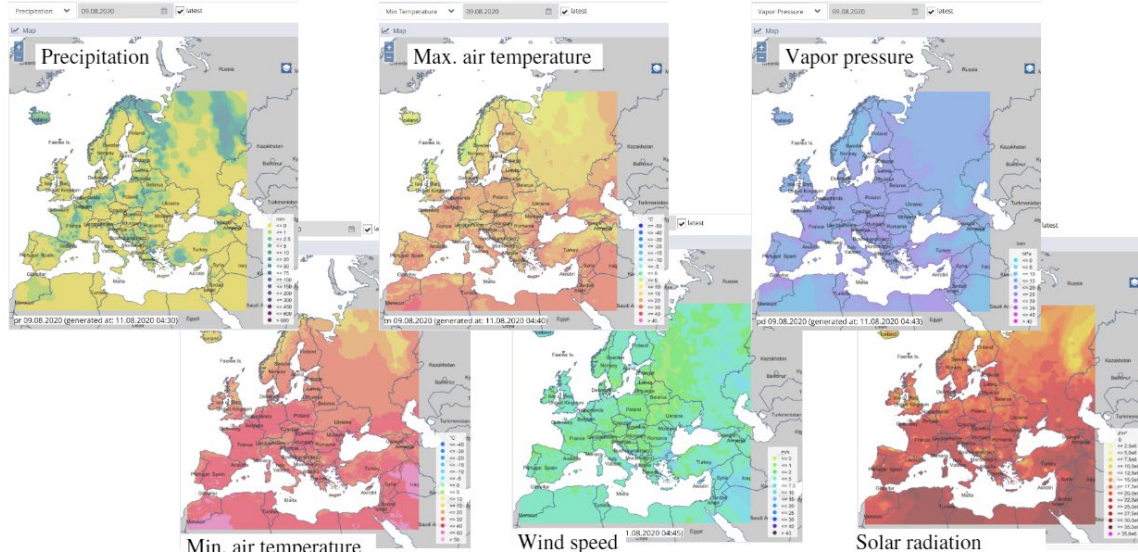
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## CEMS in-situ data collection centres

Daily grids produced:

Water-related products:
- Hydrological time series
- European Observational Grids, 5 km (EMO-5)

Emergency Management

European and Global Flood Awareness Systems (EFAS & GloFAS):

- Provide users with **complementary, added value flood forecasts**
  - Probabilistic
  - Medium-range
  - River basin wide

- Support **preparedness for floods at EU level** by providing the ERCC with an overview of ongoing and forecasted floods

- **Knowledge exchange platform** for operational flood forecasting

- **Foster collaboration and co-operation** between the different users
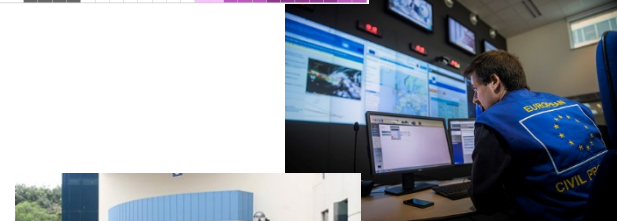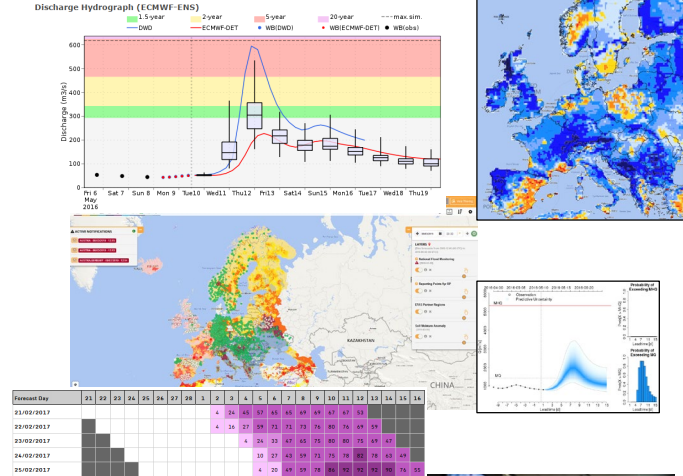
Emergency Management

European and Global Flood Awareness Systems (EFAS & GloFAS):

Water-related products:

- Medium-range, **probabilistic flood forecasts**
- Post-processed, bias correct forecasts
- **Flash flood indicators** with a lead time up to 3 days & radar-based **flash flood now-casting**
- EFAS Flood & Flash **Flood Notifications** to all partners at river basin level
- **Monitoring** of national flood alert exceedances
- **Soil moisture, snow maps, anomalies**
- Hydrological **seasonal outlook**
- **Impact forecasts** and pre-tasking of Copernicus EMS rapid mapping

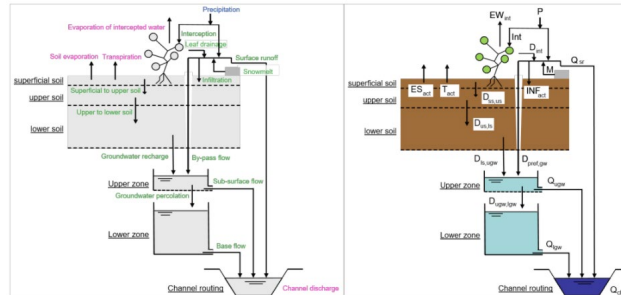→ Archived output available on the C3S Climate Data Store

Emergency
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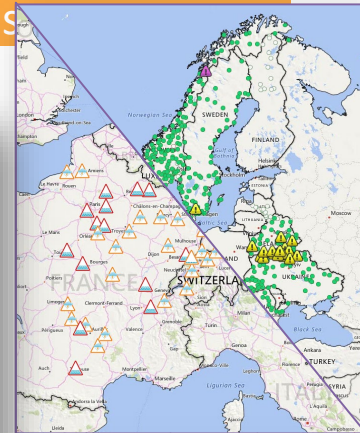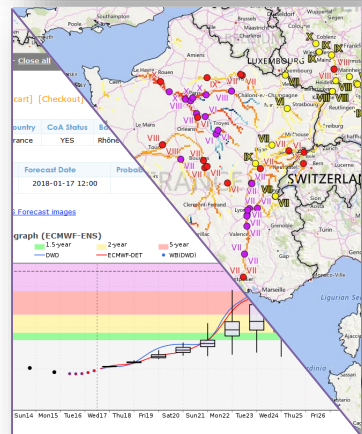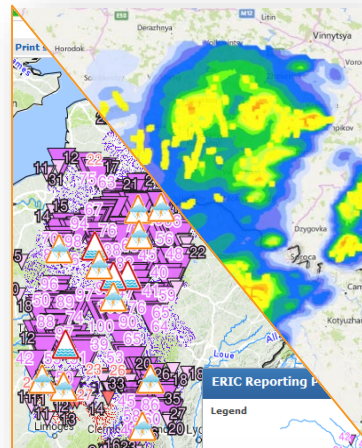
Hydrological model for CEMS: LISFLOOD

- LISFLOOD: spatially distributed rainfall-runoff model

- Open-source: https://ec-jrc.github.io/lisflood/

- comes with calibration tool, test case and further tools

Open Source Lisflood

Lisflood

LISFLOOD is a spatially distributed water resources model, developed by the Joint Research Centre (JRC) of the European Commission since 1997.

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Global automatic satellite-based flood monitoring (GFM)

- **Sentinel-1 based:** SAR enables all day and all weather flood monitoring
- High **spatial resolution of 20 m**
- **High timeliness of the product:** less than 8 hours between sensing and product delivery
- **High revisit frequency:** Europe ~ 1 – 3 days World ~ 3 – 14 days (to be further increased with Sentinel-1 C)

→ Pre-operational: May – August 2021
→ Operational: September 2021

GFM output layers:
Observed flood event, Observed water extent, Reference water mask, Exclusion mask, Uncertainty values, Advisory flags, Sentinel-1 metadata, Sentinel-1 footprint, Sentinel-1 schedule, Affected Population, Affected Landcover
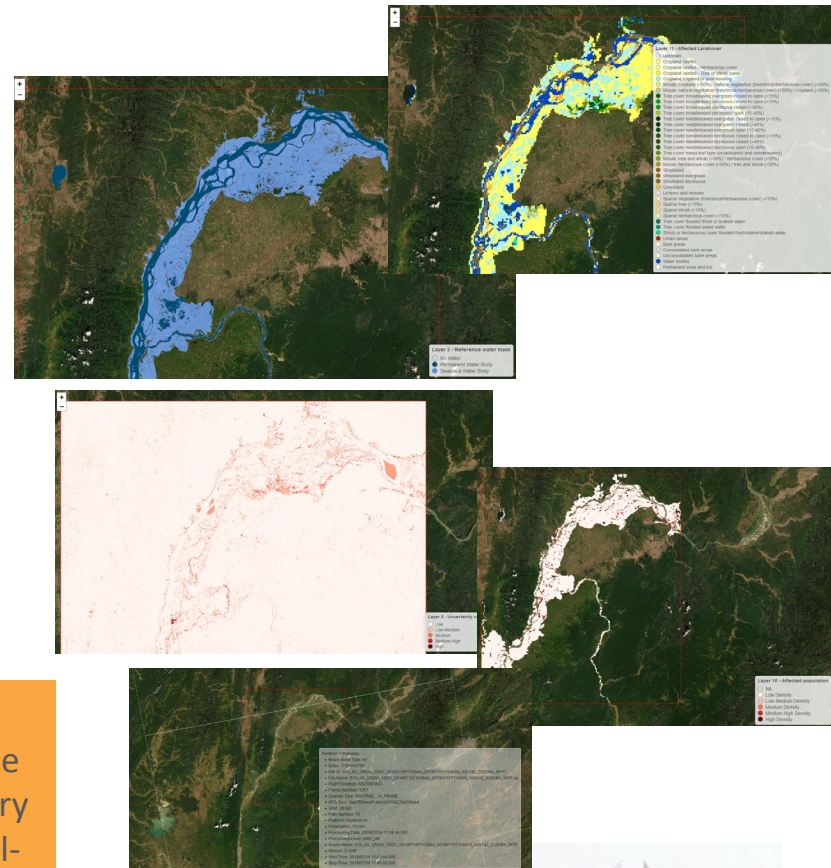
Emergency
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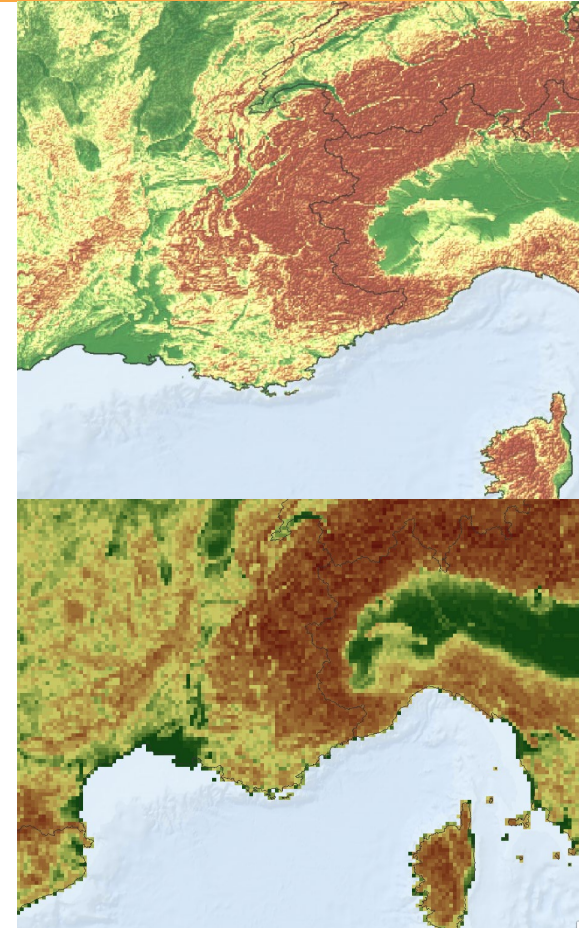
European and Global Flood Awareness Systems (EFAS & GloFAS):

Planned developments/upgrades

1) Increase spatial resolution

- **For Europe:** from 5 x 5 km to **1 arcmin** (~1.8 x 1.8 km pixel size) resolution using WGS 84 projection system -   ~2.8 fold increase in resolution with ~ 7.7 fold increase in pixels

- **Global**: from 0.1 degree to **3 arcmin** (~5.4 x 5.4 km pixel size) resolution

- Static input maps completely re-done, hydrological model will be newly calibrated

- Implementation timeline: 2022

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European and Global Flood Awareness Systems (EFAS & GloFAS):

Planned developments/upgrades

2) Coastal flood forecast component

- Research has been done at the JRC over the past couple of years

- Now at a proof of concept stage:
  https://cordis.europa.eu/project/id/101004211

- Foreseen implementation timeline: 2023/2024
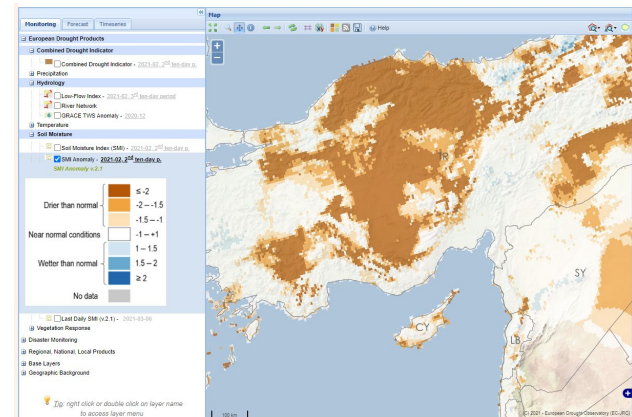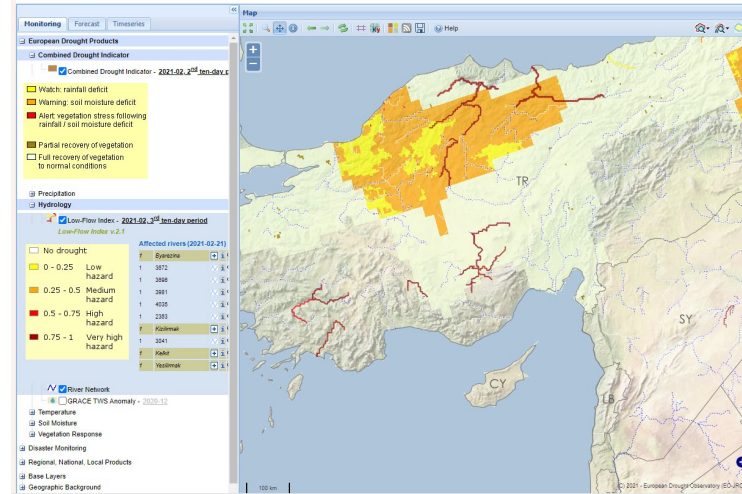
Emergency Management

European and Global Drought Observatories (EDO & GDO):

- **Continuous monitoring, forecasting** of key drought and heat indicators across **Europe** and the **World**
- Serving the EU's Emergency Response Coordination Centre (ERCC) as well as stakeholders at international and national levels
- Integration of various methods to create one drought indicator
- Historic reference database of Drought Events

Water-related datasets:
- Standardized Precipitation Index (SPI)
- Low flow indicator (LISFLOOD derived)
- Soil Moisture Anomaly (LISFLOOD derived)
- GRACE Total Water Storage Anomaly

Thank you!

Preparedness
Recovery
Response

Rapid Mapping

Risk & Recovery Mapping

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