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Emergency Management

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EFAS
meteorological inputs and flood notifications

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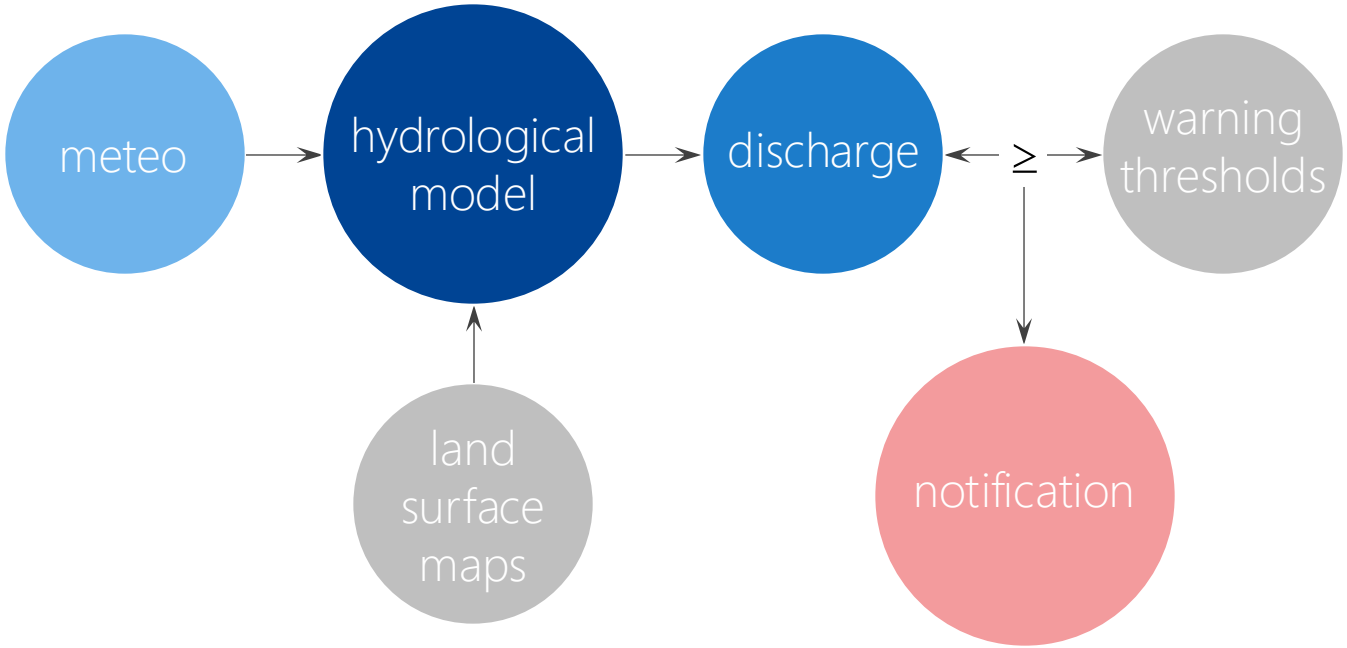
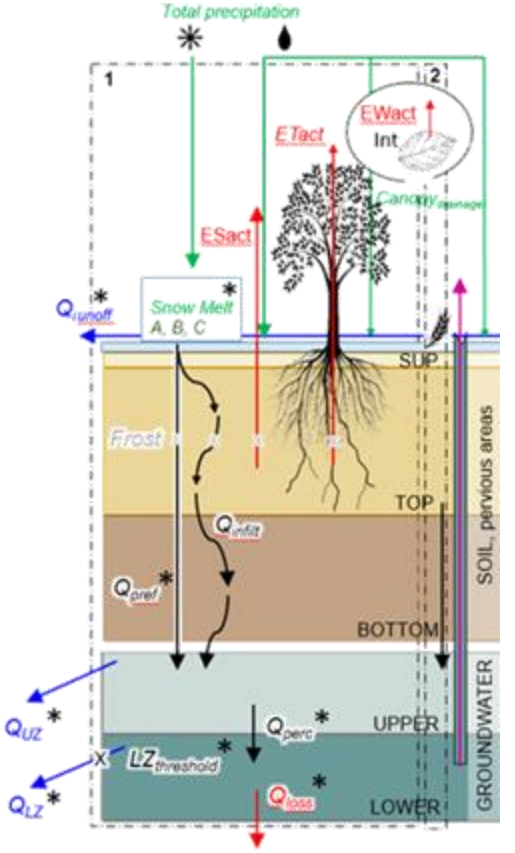
European Flood Awareness System

A flood early warning system in an extended European domain based on hydrological simulations forced with meteorological forecasts.





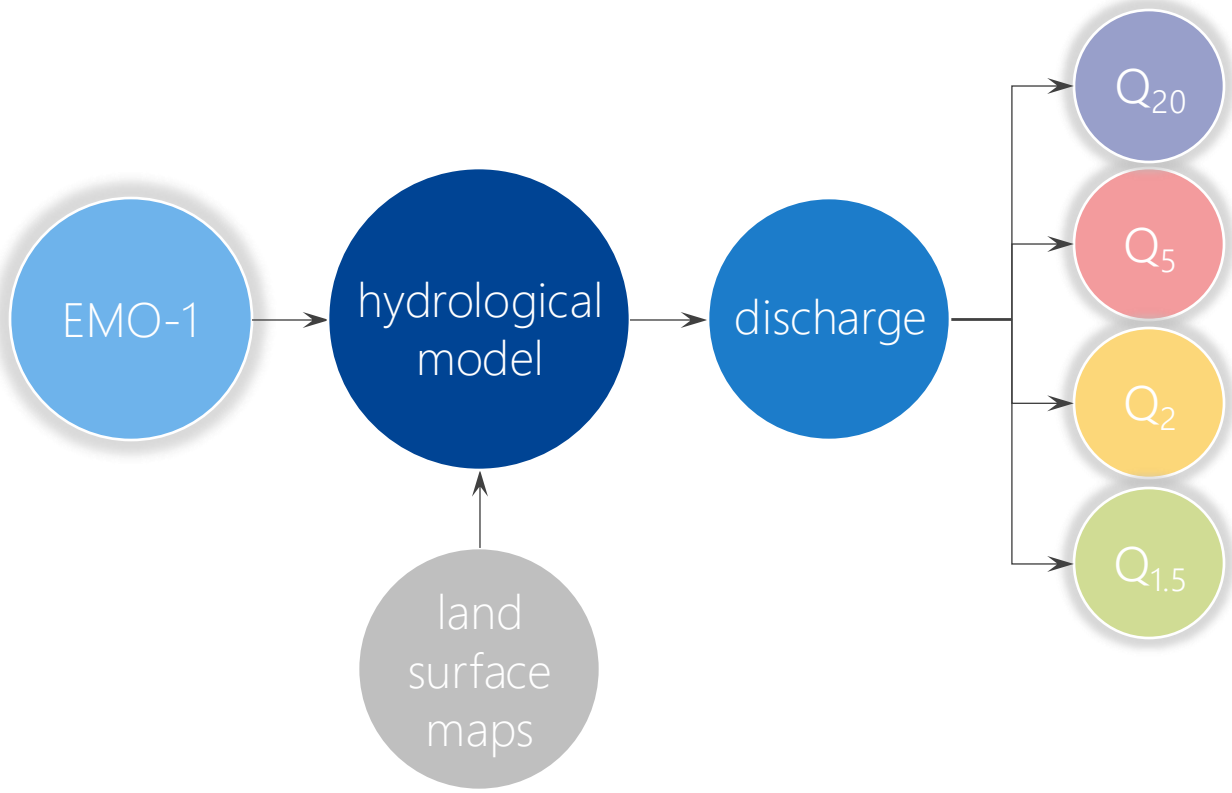
LISFLOOD-OS

Historical run

A long enough simulation (1990-2023) used to define the climatology, i.e., the warning thresholds, once before every major release.

It uses meteorological observations (EMO-1).

Discharge thresholds are subject to errors due to model simplifications, wrong parameterization, etc. However, the notification system is still valid.

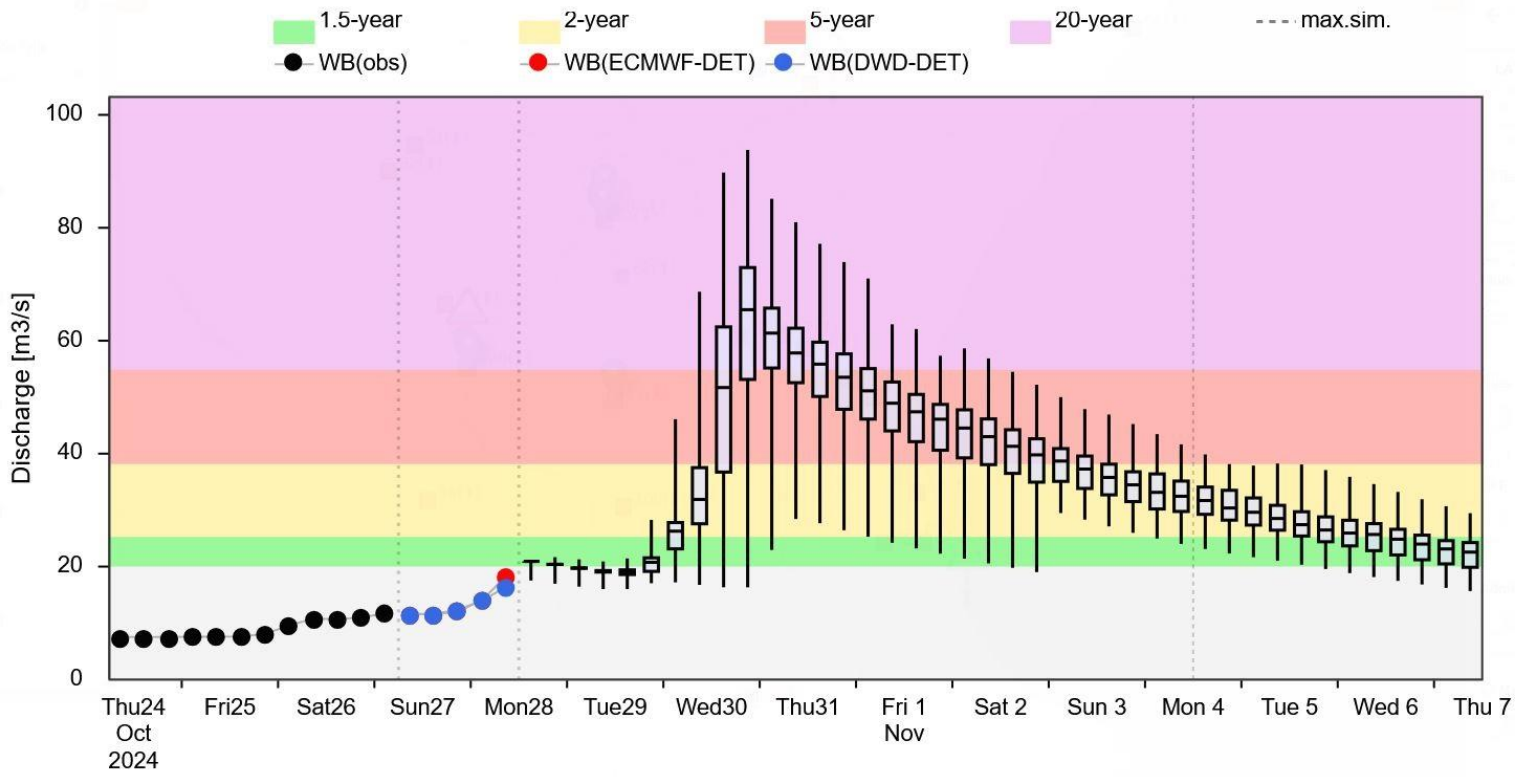


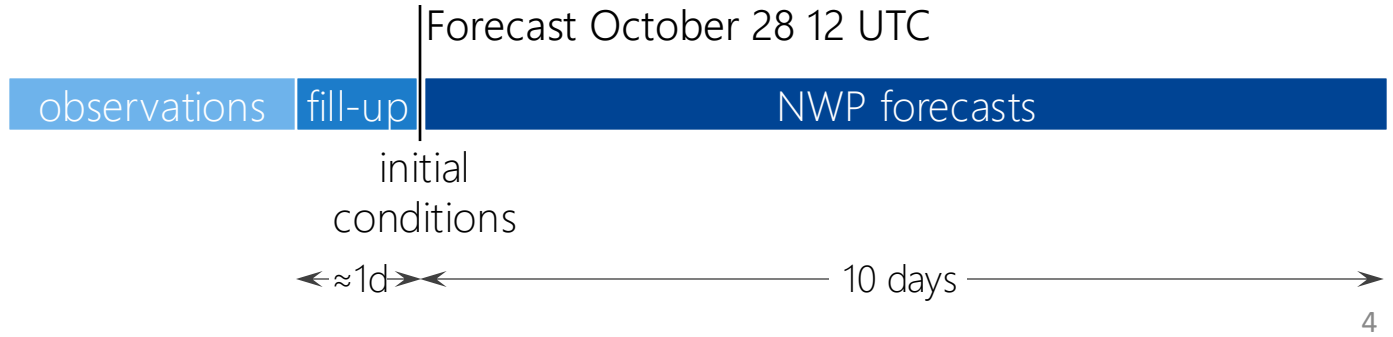
Forecast run

Forecasts are issued twice a day (00 and 12 UTC) with a horizon up to 10 days.

Meteorological inputs:

- Near-real time observations
- Past forecast in the fill-up period
- 4 meteorological forecasts





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EFAS meteorological inputs

Historical, near real-time, forecasts

Historical: the EMO-1 dataset

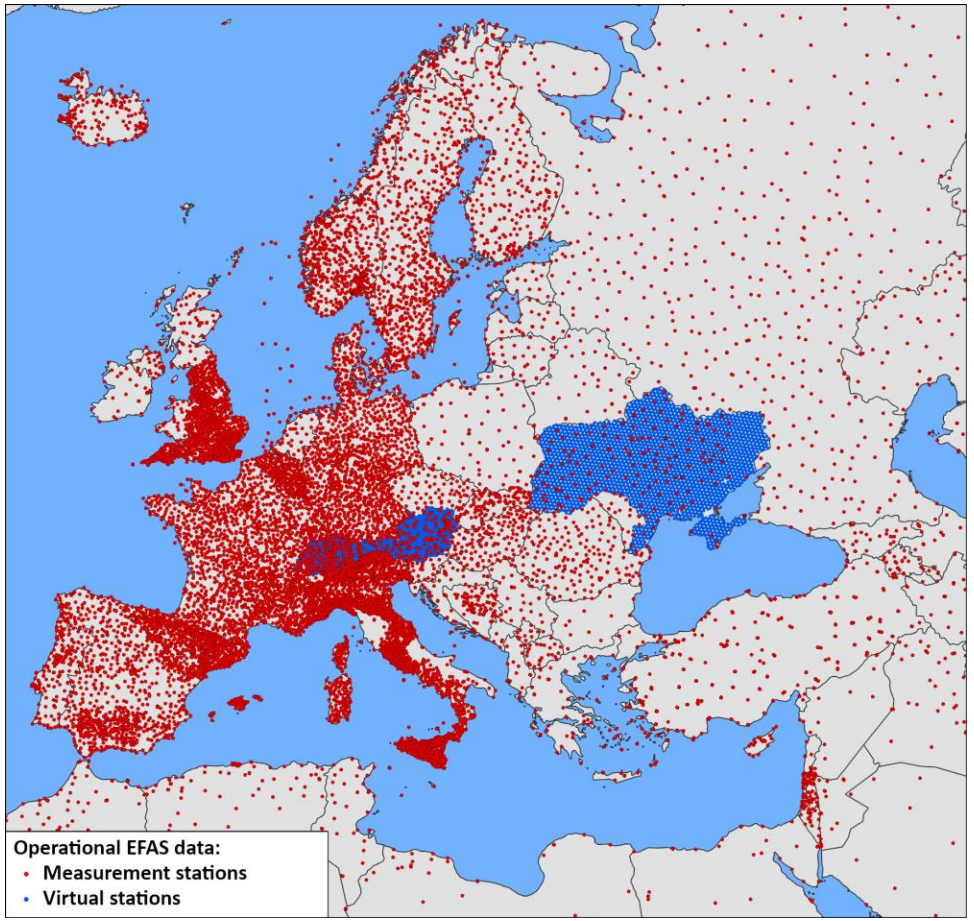
Use:
- Calibration
- Climatology

The European Meteorological Observations is a gridded dataset of historical meteorology over the EFAS domain:

- 1 arc-minute resolution
- 6 hour time steps
- 1990-2023

It is produced by validation and spatial interpolation of station records provided by EFAS partners:

- 35 data providers
- > 38,000 historical stations

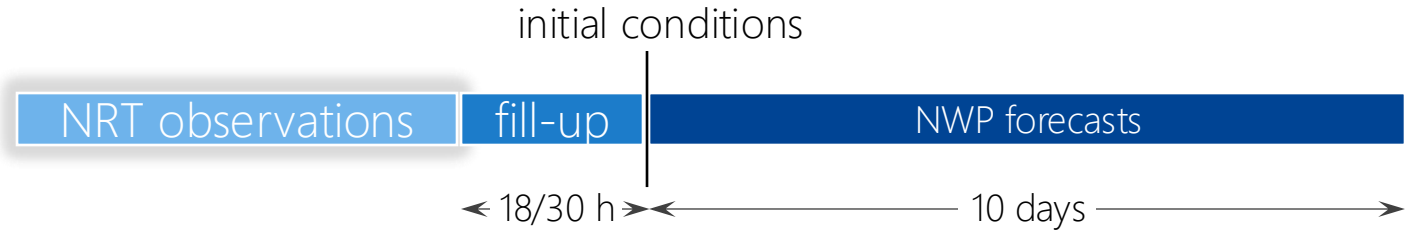


Near real-time

Use:
- Initial conditions

Operationally, observed meteorological grids are produced to establish the initial conditions for the forecast:

- 1 arc-minute resolution
- 6 hour time steps
- Up to 18-30 h before forecast time



It is produced in a similar manner as EMO-1, with the available information at that moment:

- > 24,000 real-time stations

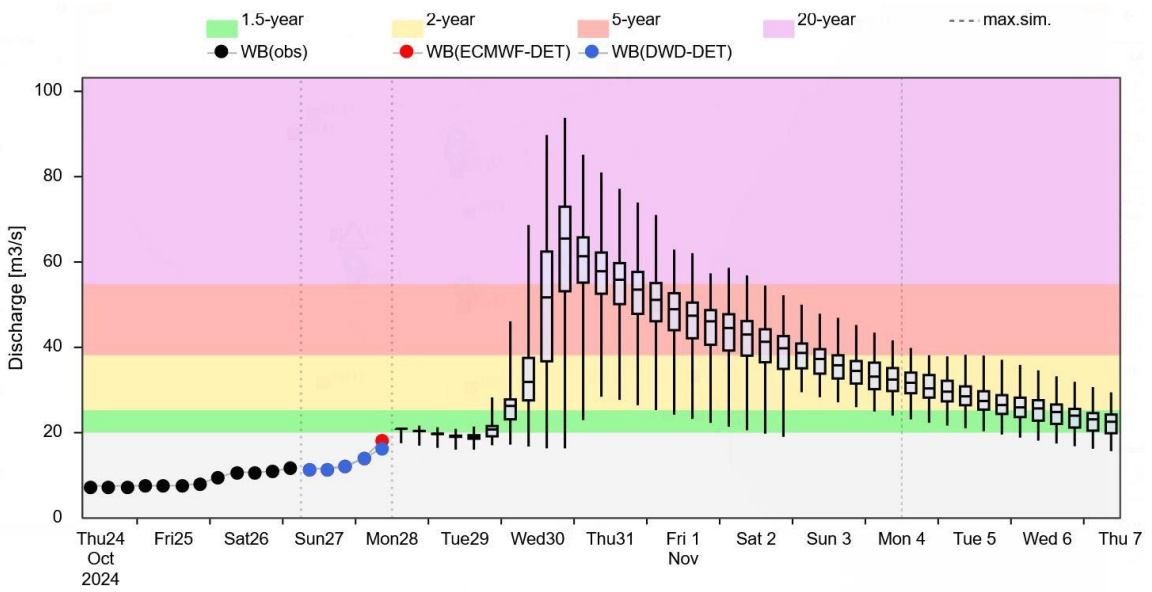
Forecasts

Use:
- Flood warnings

EFAS flood forecasts use a grand ensemble approach that combines hydrological simulations forced with four meteorological forecasts.

flash-flood notifications

Model	Provider	Horizon	Resolution	Members
COSMO-LEPS	ARPAE-ER	5.5 days	≈ 7 km	20
ICON-EU/ICON	DWD	7 days	≈ 6.5-13 km	1
HRES	ECMWF	10 days	≈ 9 km	1
ENS	ECMWF	15 days	≈ 9 km	51



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EFAS notifications

Types and interpretation

Flood vs flash-flood notifications

Flood formal (informal) notifications represent a relatively high certainty in the occurrence of a fluvial flood in the medium-range.

- Hydrological simulation of streamflow
- Medium-large river basins
- Medium-range

Flash-flood notifications are meant to fill in the gap at the short-term and smaller catchments.

- Simplified estimation of runoff
- Small river basins
- Short-range

Target:
- Medium-large basins
- Medium-range

Flood notifications

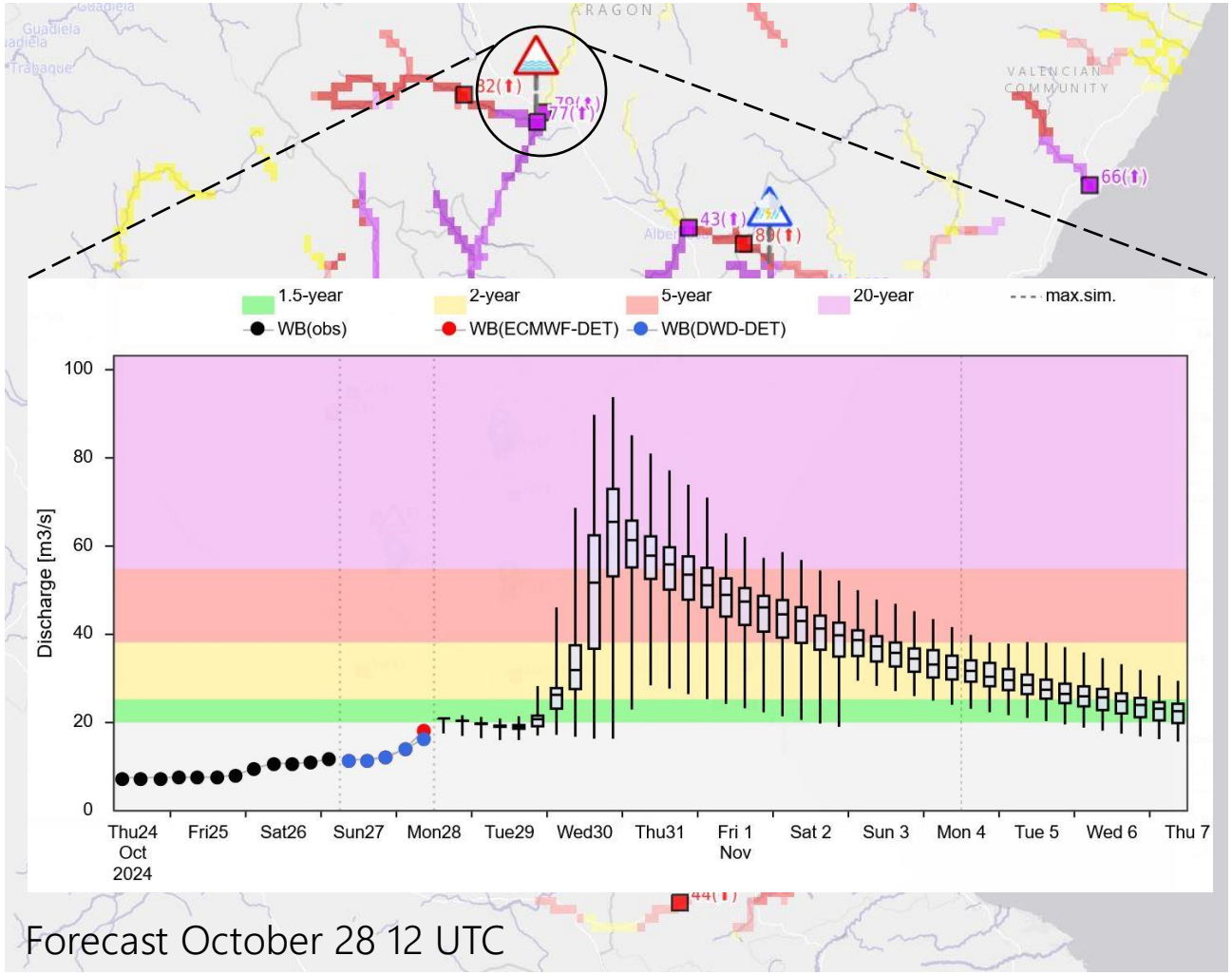
A formal flood notification is sent if:

- Catchment area ≥ 1,000 km^2
- Start of the event ≥ 2 days
- Probability of exceeding Q_5 ≥ 50%

Only one notification is sent for each river.

The user must check in the web viewer the extent of the river where the risk of flooding exists.

Informal flood notifications are sent when some of the conditions above are not fulfilled, but the officer on duty considers the event is relevant.



Target:
- Small basins
- Short-range

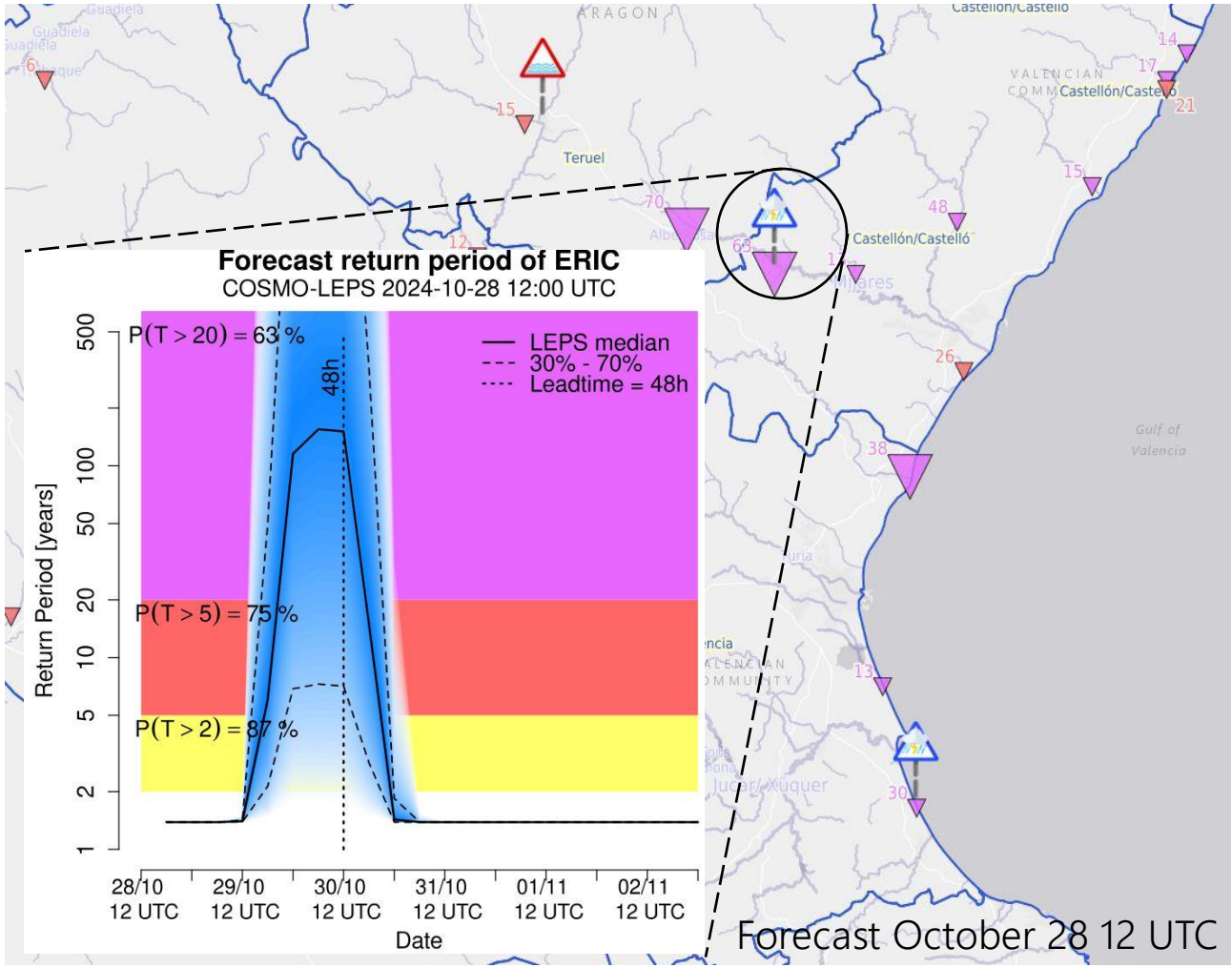
Flash-flood notifications

A flash-flood notification is sent if:

- Catchment area < 1,000 km^2
- Start of the event < 2 days
- Probability of exceeding $ERIC_5 \geq 30\%$

Only one notification is sent for each administrative region.

ERIC is an aggregated runoff index based on the COSMO-LEPS precipitation forecast and the initial soil moisture.



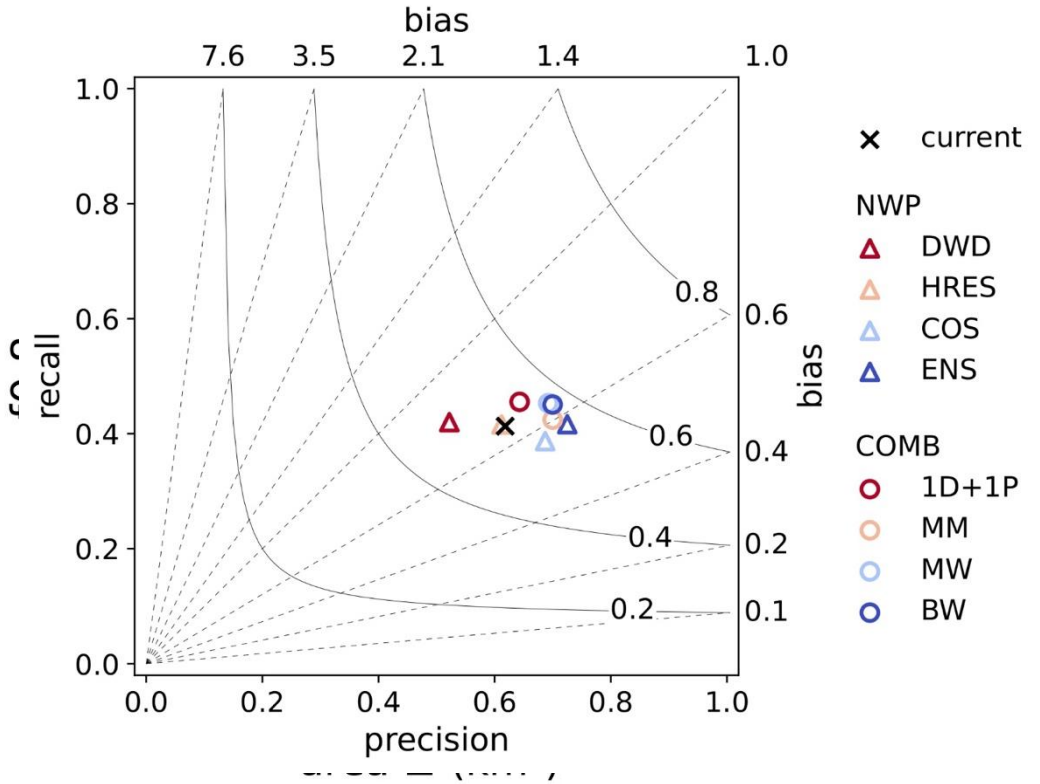
Considerations on notifications

The skill of the formal notifications increases with:

- Decreasing lead time
- Increasing catchment area

EFAS formal notifications are more prone to miss a flood event than to generate a false alarm.

Flash-flood notifications tend to be less accurate than formal notifications.



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Conclusions

EFAS uses two types of meteorological inputs:

1. Maps produced from observations at stations
2. Meteorological forecasts

EFAS issues two complementary types of notifications:

1. Formal notifications apply to medium to large catchments and medium-range lead times
2. Flash-flood notifications apply to small catchments and short lead times

Introducing EDERA products in EFAS could:

1. Reduce the fillup time by using radar observations
2. Improve the skill of flash-flood notifications

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Thank you