Deutscher Wetterdienst
Wetter und Klima aus einer Hand

Enhancing the collaboration and communication between weather and flood forecasting in Germany following a Co-Design approach

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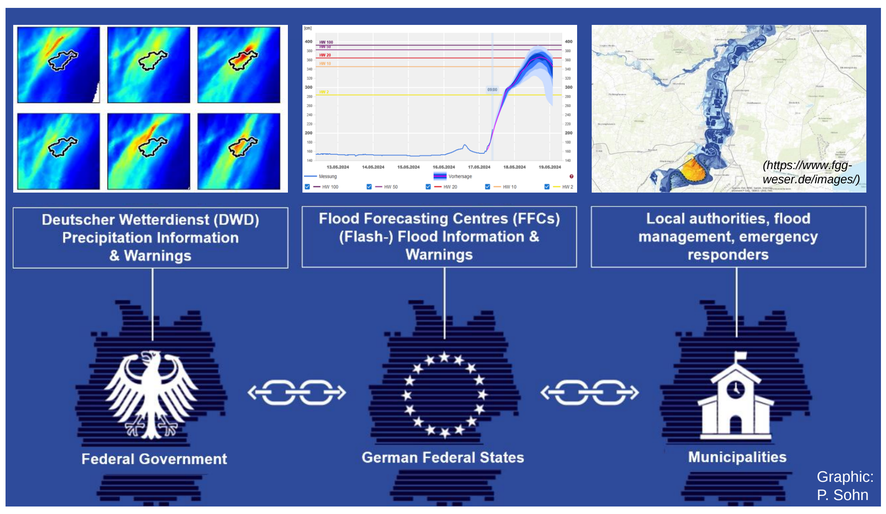
In recent years, several regions in Germany experienced devastating floods caused by heavy precipitation events, often associated with severe convective storms. To improve the prediction of such events and corresponding warning strategies, Deutscher Wetterdienst (DWD) is intensifying its collaboration with Germany's flood forecasting authorities.

Forecasting & alerting chain for fluvial floods



Modelling Perspective

- ➔ DWD provides e.g. precipitation forecast data and products to customers, like German flood forecasting centres, local authorities and emergency responders
- ➔ Flood forecasting centres (FFCs), based in regions, run their flood forecasting models based on DWD and other data, and provide flood forecasts to customers

Warning Perspective

- ➔ DWD issues warnings for precipitation and other meteorological variables
- ➔ Flood forecasting centres issue flood warnings for their respective regions

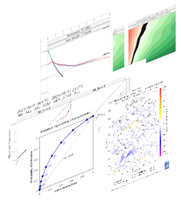
Challenges

- ➔ Weather and flood forecasting structurally/administratively quite separate
- ➔ Improvement requires collaboration along the value chain and joint developments

Bridge knowledge gaps between operational services

Joint Project of DWD with FFCs to augment the hydrometeorological value chain through:

- ➔ Automated tool for flood forecasters for **post-event evaluation** of rainfall forecasts in **affected river catchments**
- ➔ Statistical precipitation **verification for hydrologists**
- ➔ Adaptation of DWD's new warning system to needs of flood forecast
- ➔ Improving communication of forecasts and warnings

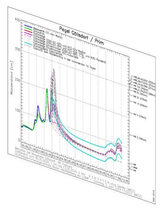


User-oriented precipitation evaluation & verification for hydrologists

National Weather Service, DWD

Evaluation

Regional Flood forecasting Centres, FFCs



Feedback on performance of rainfall forecasts in hydrological models

The Co-Design Project is part of the Italia – Deutschland science-4-services network in weather and climate (IDEA-S4S)

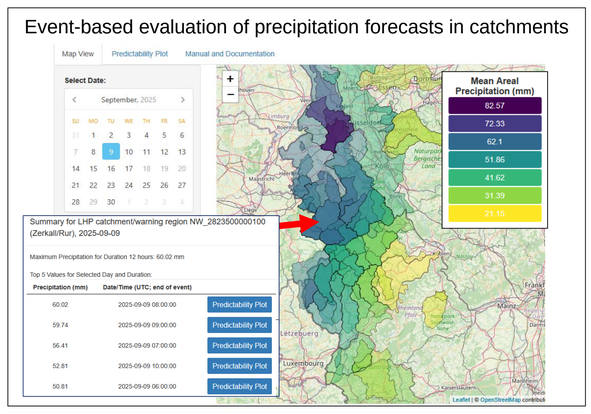
User-oriented precipitation evaluation

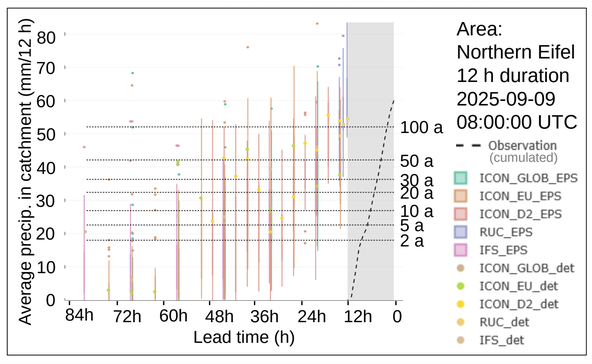
Motivation:

- ➔ Assess performance of precipitation forecasts for river catchments
- ➔ Number of weather forecast data increases continuously, FFCs want to know, which is the best forecast to use for their runs

Approach:

- ➔ Automated tool for flood forecasters for post-event evaluation of rainfall forecasts in affected river catchments
- ➔ Based on areal rainfall and extreme value analysis to get return periods





Figures: Overview of mean areal precipitation (mm) in catchments for specific event (top). Predictability plot for selected catchment of Northern Eifel, showing performance of different models in predicting the selected event (bottom)

Verification of runoff forecasts

Verification aspects:

Discharge forecast skill analysed with respect to:

- ➔ meteorological forecast products
- ➔ precipitation types, catchment sizes
- ➔ forecast lead times
- ➔ hydrological cases (rising and falling limbs of the hydrograph, etc.)

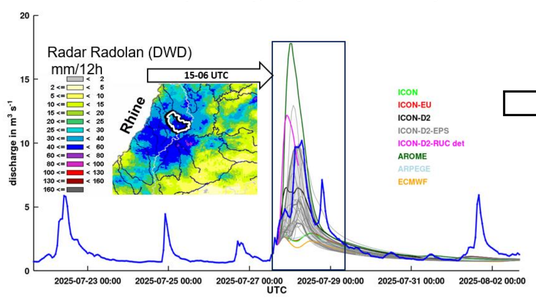
Data basis:

- ➔ Re-forecasts using LARSIM - hydrological model of FFC Baden-Württemberg
- ➔ develop flood-event catalogue, also collaboration with other FFCs

Test of metrics:

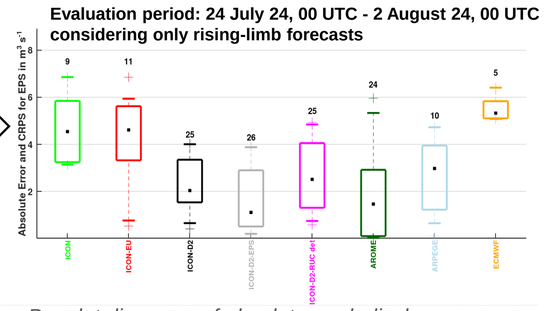
Categorical (event-based), Continuous (value-based), Ensemble (probabilistic)

Bruchsal / Saalbach (173 km²), a right-bank tributary of the Rhine



Hydrograph of observed discharge (dark blue) at Bruchsal gauge, and discharge forecasts issued at 15 UTC (from operational system of FFC Baden-Württemberg)

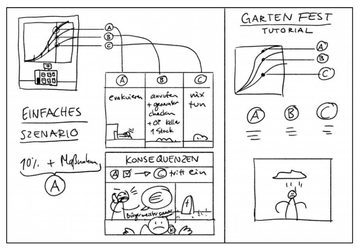
Evaluation period: 24 July 24, 00 UTC - 2 August 24, 00 UTC considering only rising-limb forecasts



Boxplot diagrams of absolute peak discharge errors (|observation − forecast|) for deterministic forecasts, and boxplots of Continuous Ranked Probability Score (CRPS) values computed from peak discharge errors for ensemble forecasts, all for 12-hour fcst lead time

Improved communication along the value chain

- ➔ Integrate features for FFCs in DWD's new warning portal, e.g. product for precipitation-based flood risks in small catchments
- ➔ Joint development of E-Learnings and Serious Games on hydrology-relevant topics, including incorporation of uncertainty in decision making



Serious Game: Decide on holding or cancelling a city festival, based on forecast with uncertainty information

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