Towards improved hydro-meteorological Ensemble Forecasting for Flood Warning in small Catchments in Saxony, Germany

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Motivation

Reliable warnings and forecasts of extreme precipitation and resulting floods

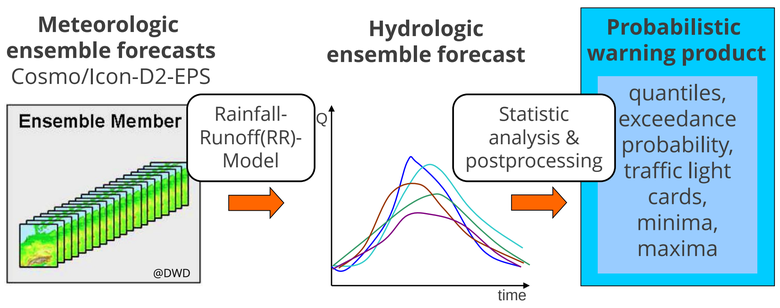
Requirements: extended lead times

Challenges for small catchments: Rainfall forecasts are uncertain

Goal: Hydro-meteorological ensemble forecasts

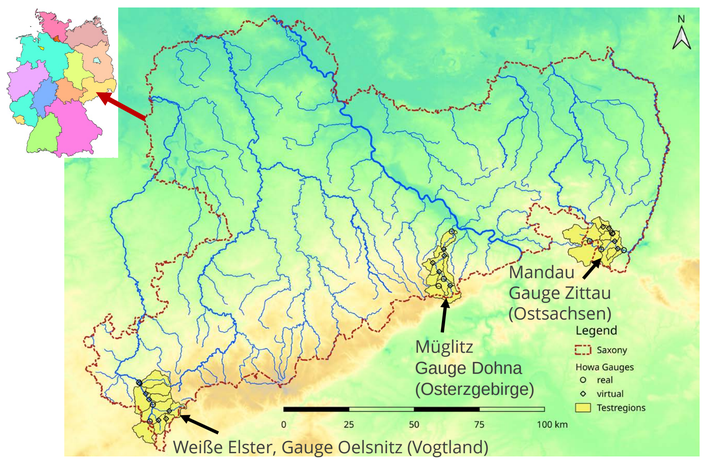
- Benefit for small catchments ?
- Appropriate „products“ for communicating uncertainties ?

Methodology



- Development and test of appropriate visualisations for flood early warning in collaboration with civil protection stakeholders
- Web-based demonstration platform for flood early warning

Region

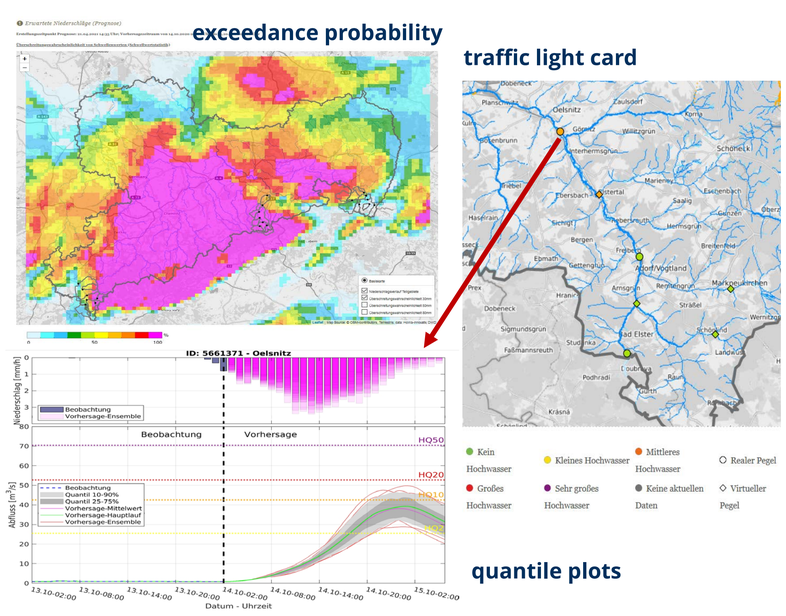


Catchments of different hydrologic characteristics

Web-based demonstration platform for flood early warning

- Warning for extreme rainfall in Saxony by quantile maps and exceedance probability maps of different rainfall thresholds
- Discharge forecast for gauged and ungauged catchments in three pilot regions for next 27 hours
- History of last 24 hours
- Hourly forecast update if new observations are available
- **Live mode**: http://howa-innovativ.hydro.tu-dresden.de/WebDemoLive/
- Events in the past: http://howa-innovativ.hydro.tu-dresden.de/WebDemo/

explore event



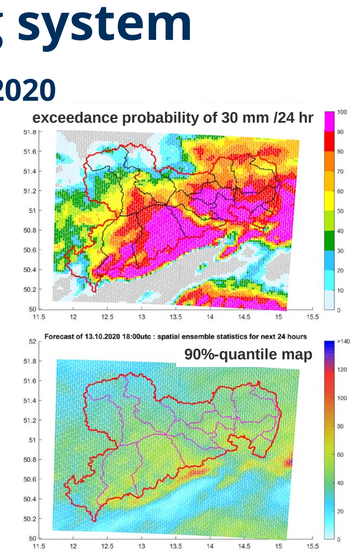
Performance of the early warning system

Flood event 13.-14.10.2020

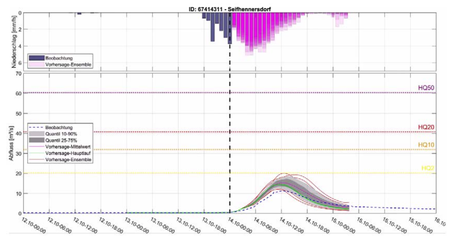
Extreme continuous rain

Right: **Forecast** CosmoD2eps from 13.10.2020, 18:00 utc for next 24 hours

Below: **Radar observation** for the same period



Right: **Hydrologic ensemble forecast,** *top:* areal rainfall, *bottom:* discharge in comparison to observation

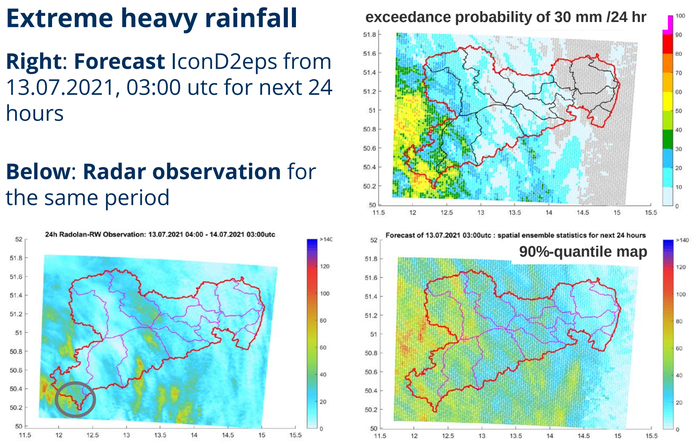


Flood event (13.7.2021), Vogtland

Extreme heavy rainfall

Right: **Forecast** IconD2eps from 13.07.2021, 03:00 utc for next 24 hours

Below: **Radar observation** for the same period



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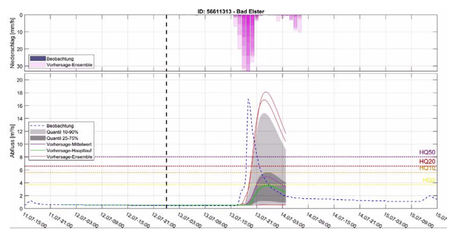

Next steps towards improved hydro-meteorological ensemble forecasting

Observed and forecasted precipitation input

- New QPE-product based on commercial microwave links (CML)
- Radar based nowcasting for short term forecasts of the next 2 hours
- Enlargement of forecast period to 48 hours, more frequent updates
- Flexible Interface for integration of new data products

Hydrological forecast modelling

- New features for flood reservoir operation
- Increased numbers of catchments/regions
- Open model interface

Post-processing, visualisation and communication

- Extended options for visualisation of forecast performance
- New web-based visualisation dash board
- Dialogue with users → Decision making under uncertainty
- Training tools & scenario-based serious game development

Further contributions

EGU23-13779: Development of a Python Framework (pyRadman) for QPE using radar and CML data at DWD, *by Wenzel et al.*

EGU23-14994: Improved QPE for the Ahr flooding event using weather radar and CML data, *by Graf et al.*

EGU23-8978: Precipitation Data Harmonizer: Harmonizing radar, nowcast, and forecast precipitation data for hydrological applications, *by Wagner & Grundmann*

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