A skill assessment of the European Flood Awareness System notifications

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The European Flood Awareness System (EFAS) is an operational forecasting system whose aim is to raise awareness about floods in European transnational rivers. It produces probabilistic, medium-range discharge forecasts twice a day by running the LISFLOOD hydrological model with four different meteorological forcing, both deterministic (DWD, ECMWF-HRES) and probabilistic (ECWMF-ENS, COSMO-LEPS). Based on these forecasts, flood notifications are issued to the EFAS partners if a set of criteria is met: contributing area larger than 2000 km², lead time from 48 to 240 h, at least one deterministic model exceeds the discharge threshold (5-year return period), and at least one probabilistic model predicts 30% exceedance probability of that discharge threshold for three or more consecutive forecasts.

The configuration of EFAS has changed since the time when these notification criteria were defined. For instance, the temporal resolution has increased from daily to 6-hourly, and the spatial resolution is planned to improve from 3 arcminute to 1 arcminute. This study aims at assessing the skill of the notification criteria above presented with the current system setup, and to derive a new set of criteria that optimizes the notification skill. We will focus on three research questions: how can we combine the different models (deterministic and probabilistic) into a grand ensemble and what probability threshold optimizes skill? Is the persistence criterium interesting both at shorter and larger lead times? Can we reduce the contributing area threshold without compromising skill?

The last major change in the EFAS setup took place in October 2020, when the temporal resolution increased to 6-hourly. Reanalysis and forecast data at the EFAS reporting points (over 2300 stations across Europe) are available from that moment to the present. By comparing the reanalysis data with the discharge threshold, a total of 1327 “observed” flood events has been identified in the 2 years from October 2020 to October 2022. The “notified” events will be computed by comparing the forecast data against the notification criteria; we will compute skill metrics (f1, Hanssen-Kuipers) at each daily lead time for different combinations of meteorological forcing and notification criteria in order to find the procedure that maximizes the skill of EFAS notifications.

The outcome of this study will be applied to the EFAS operational system, so it will have direct impact on the preparedness of member-states in future flood events.