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Assessment of GloFAS ensemble flood forecast for the Brahmaputra basin: skilful lead-times to predict monsoon floods for early action in Bangladesh

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Flood is a frequent natural hazard in the Brahmaputra basin in Bangladesh during the South Asian summer monsoon between June to September. When will flooding start during monsoon and how long it will last are two important questions that forecasters need to answer. Predicting flood timing and duration with a sufficient lead-time is challenging for forecasters due to strong intraseasonal variation of floods within a monsoon.

The GloFAS forecasting system is run by ECMWF as part of the Copernicus Emergency Management Service and provides operational extended-range ensemble flood forecast with 30 days lead-time for the major river basins in the world. In this study, we evaluated GloFAS reforecasts for the Brahmaputra basin in Bangladesh for the period 1997–2019 at different lead-times against observed stream gauge and ECMWF ERA5 reanalysis river discharge data. We used various probabilistic forecast verification metrics, such as Relative Operating Characteristic (ROC), False Alarm Ratio (FAR), and Probability of Detection (POD), to study how forecast skill varies over different lead-times. We also assessed the skilful lead-times of the GloFAS forecast to predict flood timing and duration during the monsoon. These scores were calculated considering relevant flood threshold levels and action-based parameters, such as Action Lifetime, based on user needs in Bangladesh. The GloFAS forecast case study for the recent 2020 monsoon floods in the Brahmaputra basin shows that the onset of flood events was successfully predicted with a lead-time of 15 days. These forecasts were disseminated among the different stakeholders, including humanitarian agencies, flood and disaster management organisations, to inform forecast-based actions, such as evacuation of vulnerable people to safer places ahead of flood events. Our study demonstrates that GloFAS ability to predict monsoon floods in terms of timing and duration can improve national flood forecasting capabilities providing sufficient lead-time for early actions in Bangladesh. The study will help forecasters as well as users to understand forecast skill and associated uncertainty in probabilistic forecasts to predict flood events in Bangladesh.