

# Probabilistic Predictions for Hydrology Applications

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Recent advances in weather prediction techniques with higher accuracy, higher model resolution and longer lead time have encouraged the user communities to utilize the forecast products for various applications including in hydrology (drought management, reservoir management and river streamflow, flood forecasting etc.). It is believed that ensemble prediction systems exhibit greater forecast skill than any single model. A probabilistic forecast is reliable if the observed frequency of the event for a given forecast probability is equal to the forecast probability and forecasts from ensemble members should be statistically identical to the observations. There has been no systematic study on the usability of ensemble precipitation forecasts at river basin scale for hydrology applications. Moreover, the model products have to be carefully interpreted and used in various hydrologic application models as these forecasts may have large systematic bias.

For this study, medium-range forecasts (23 ensemble members) of rainfall (from day-1 to day7) from the NCMRWF ensemble forecast system (at ~12 km i.e. N1024L70 resolution) have been used. It is based on Unified Model version 10.8 of UKMO. Observed rainfall (merged satellite and gauge data) for the Indian region has been prepared jointly by IMD and NCMRWF. Some of the major river basins (Ganges, Brahmaputra, Satluj, Godavari, Narmada, Mahanadi, Krishna and Cauvery) have been considered. Water level and storage data has been examined in detail to predict inflow of water to reservoirs in these basins using the rainfall forecasts in medium range and hydrology model (SWAT model). It is found that the model has reasonable skill in forecasting rainfall (ensemble mean) over these basins up to 7 days in advance. The model could predict categorical rainfall (hits) for several rainfall events, however, the number of false alarms are larger than number of hits. The RMSE and ensemble spread remain almost the same as the forecast length increases over all the river basins. Therefore, the forecast quality does not deteriorate as the forecast length increases. The ensemble spread of rainfall is almost half of the RMSE values for each of the river basin. The probabilistic forecasts are not reliable for any of the categories. The model forecasts overestimate the observed frequency over all the river basins. Forecasts with probability values of more than 70% do not have any skill. Several statistical post-processing methods have been applied to improve the forecast skill which will be presented in the Conference.