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A Real-time Ensemble Hydrological Forecasting System over Germany at Sub-seasonal to Seasonal Time Range

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Real-time hydrological forecasting provides valuable information to mitigate the impact of extreme hydrological events such as flood and drought. An ensemble hydrological forecasting system is developed to investigate the hydrological predictability at sub-seasonal to seasonal (S2S) time scale over Germany. The ensemble hydrological simulations are performed with the mesoscale hydrologic model (mHM) which benefits from a multiscale parameter regionalization module (MPR). The model is forced by the operational ensemble prediction System from the European Center for Medium-range Weather Forecast (ECMWF). 51 hydrological ensemble forecasts are generated in real-time (twice a week) for up to 45 days in advance. We used the initial condition records from the German Drought Monitor (GDM, www.ufz.de/duerremonitor) which provides daily up-to-date high resolution drought information at a spatial resolution of 4 km. The performance of the system is evaluated for three consecutive years started from 2016 for Soil Moisture Index (SMI) and real-time streamflow records (222 based in Zink et al 2017). Comparison between forecasted Soil Moisture Index (SMI) and the one derived by the GDM suggested promising results for certain areas over the study area at S2S time scale. The predictability of the ensemble forecasting system is evaluated against that generated with the Ensemble Streamflow Prediction (ESP) method. This research is one of the first attempts to investigate the hydrological forecasting skill at S2S time scale in Europe. The study is supported as a part of the Modular Observation Solutions for Earth System (MOSES) project.