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Comparing complementary NWP model performance for hydrologic forecasting for the river Rhine in an operational setting

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This paper investigates the performance of complementary NWP models for hydrologic forecasting for the river Rhine, a large river catchment in Central Europe. An operational forecasting system, RWsOS-Rivieren, produces daily forecasts of discharges and water levels at the Water Management Centre Netherlands. A combination of HBV (rainfall-runoff) and SOBEK (hydrodynamic routing) models is used to produce simulations and forecasts for the catchment. Data assimilation is applied both to the model state of SOBEK and to model outputs. The primary function of the operational forecasting system is to provide reliable and accurate forecasts during periods of high water. The secondary main function is producing daily predictions for water management and water transport in The Netherlands. In addition, predicting water levels during drought periods is becoming increasingly important as well.

At this moment several complementary deterministic and ensemble NWP models are used to provide the forecasters with predictions with varied initial conditions, such as ICON, ICON-EU Nest, ECMWF-DET, ECMWF-EPS, HiRLAM, COSMO-LEPS and GLAMEPS. ICON and ICON-EU have recently replaced DWD-GME and DWD COSMO-EU. These models provide weather forecasts with different lengths of lead times and also different periods of operational usage. A direct and quantitative comparison is therefore challenging. Nevertheless, it is important to investigate the suitability of the different NWP models for certain lead times and certain weather situations to help support the hydrological forecasters make an informed forecast during an operational crisis. A hindcast study will investigate the performance of these models in the operational system for different lead times and focusing on periods of both high and low water for Lobith, the location of entry of the river Rhine into The Netherlands.