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Coupled lagged ensemble weather- and river runoff prediction in complex Alpine terrain

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It is still a challenge to predict fast reacting streamflow precipitation response in Alpine terrain. Civil protection measures require flood prediction in 24 – 48 lead time. This holds particularly true for the Ammer River region which was affected by century floods in 1999, 2003 and 2005.
Since 2005 a coupled NWP/Hydrology model system is operated in simulating and predicting the Ammer River discharges. The Ammer River catchment is located in the Bavarian Ammergau Alps and alpine forelands, Germany. With elevations reaching 2185 m and annual mean precipitation between 1100 and 2000 mm it represents very demanding test ground for a river runoff prediction system. The one way coupled system utilizes a lagged ensemble prediction system (EPS) taking into account combination of recent and previous NWP forecasts. The major components of the system are the MM5 NWP model run at 3.5 km resolution and initialized twice a day, the hydrology model WaSiM-ETH run at 100 m resolution and Perl object environment (POE) implementing the networking and the system operation.
Results obtained in the years 2005-2012 reveal that river runoff simulations depict already high correlation (NSC in range 0.53 and 0.95) with observed runoff in retrospective runs with monitored meteorology data, but suffer from errors in quantitative precipitation forecast (QPF) from the employed numerical weather prediction model.
We evaluate the NWP model accuracy, especially the precipitation intensity, frequency and location and put a focus on the performance gain of bias adjustment procedures. We show how this enhanced QFP data help to reduce the uncertainty in the discharge prediction.
In addition to the HND (Hochwassernachrichtendienst, Bayern) observations TERENO Longterm Observatory hydrometeorological observation data are available since 2011. They are used to evaluate the NWP performance and setup of a bias correction procedure based on ensemble postprocessing applying Bayesian (BMA) model averaging.
We first present briefly the technical setup of the operational coupled lagged NWP/Hydrology model system and then focus on the evaluation of the NWP model, the BMA enhanced QPF and its application within the Ammer simulation system in the period 2011 – 2012