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Streamflow data assimilation for the mesoscale hydrologic model (mHM) using particle filtering

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Data assimilation has been becoming popular to increase the certainty of the hydrologic prediction considering various sources of uncertainty through the hydrologic modeling chain. In this study, we develop a data assimilation framework for the mesoscale hydrologic model (mHM 5.2, http://www.ufz.de/mhm) using particle filtering, which is a sequential DA method for non-linear and non-Gaussian models. The mHM is a grid based distributed model that is based on numerical approximations of dominant hydrologic processes having similarity with the HBV and VIC models. The developed DA framework for the mHM represents simulation uncertainty by model ensembles and updates spatial distributions of model state variables when new observations are available in each updating time interval. The evaluation of the proposed method is carried out within several large European basins via assimilating multiple streamflow measurements in a daily interval. Dimensional limitations of particle filtering is resolved by effective noise specification methods, which uses spatial and temporal correlation of weather forcing data to represent model structural uncertainty. The presentation will be focused on gains and limitations of streamflow data assimilation in several hindcasting experiments. In addition, impacts of non-Gaussian distributions of state variables on model performance will be discussed.