EGU21-10549
https://doi.org/10.5194/egusphere-egu21-10549
EGU General Assembly 2021

Applying ensemble Kalman Filtering to improve operational flood forecasting for the Berkel catchment (Eastern Netherlands)

Eoin Burke
Fluid Hydrology, Netherlands (burke.eoin.m@gmail.com)

The Berkel catchment in the east of the Netherlands and western Germany is an area with a long history of river flooding. Flooding in the area is caused by a combination of fast responding hydrological characteristics in the upper catchment and impermeable glacial till in the shallow subsurface. In the past, flood mitigation in the Berkel catchment involved straightening river channels, minimising vegetation growth in the watercourse and an extensive weir network to control water flow. The changing climate and an integral approach to water management demand a modern, robust approach to mitigating flood damage in the Berkel catchment. As a result, an operational flood forecasting system (Delft-FEWS) which utilises recently developed hydrologic rainfall-runoff models and state of the art data assimilation (DA) methods has been developed. This system generates 7-day discharge forecasts at hourly intervals using meteorologic forecast and local discharge observations.

The lowland rainfall-runoff model, WALRUS (Brauer et al., 2014) is implemented to generate discharge forecasts. The WALRUS model set-up has been designed and calibrated in a semi-distributed layout to ensure the spatial and temporal elements of discharge peaks are captured. Importantly, this flood forecasting system has adopted recent advancements in DA to strengthen the accuracy of flood forecasts. Specifically, the DA method used in this system follows the work by Sun et al. (2020). The DA allows the model to be updated using field observations at 5 locations in the catchment, available in near real-time. Reforecasting illustrates the advantages of using rainfall-runoff models that capture the specific hydrologic characteristics of a catchment as well as the benefit of using advanced DA methods in flood forecasting.

Reference

Brauer, C. C., Teuling, A. J., Torfs, P. J. J. F., & Uijlenhoet, R. (2014). The Wageningen Lowland Runoff Simulator (WALRUS): a lumped rainfall–runoff model for catchments with shallow groundwater. Geoscientific model development, 7(5).

Sun, Y., Bao, W., Valk, K., Brauer, C. C., Sumihar, J., & Weerts, A. H. (2020). Improving forecast skill of lowland hydrological models using ensemble Kalman filter and unscented Kalman filter. Water Resources Research, 56(8), e2020WR027468.