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Continental scale data assimilation of discharge and its effect on flow predictions

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Floods are the most frequent of natural disasters, affecting millions of people across the globe every year. The anticipation and forecasting of floods at the global scale is crucial to preparing for severe events and providing early awareness where local flood models and warning services may not exist (Emmerton et al., 2016). Current global flood forecasting system heavily rely on forecast forcing (precipitation, temperature, reference potential evaporation) to derive initial state estimates of the hydrological model for the next forecast (e.g. by glueing the first day of subsequent forecast as proxy for the historical observed forcing). It is clear that this approach is not perfect and that data assimilation can help to overcome some of the weaknesses of this approach. So far most hydrologic da studies have focused mostly on catchment scale. Here we conduct a da experiment by assimilating multiple streamflow observations across the contiguous united states (CONUS) and Europe into a global hydrological model (W3RA) and run with and without localization method using OpenDA in the global flood forecasting information system (GLOFFIS). It is shown that assimilation of streamflow holds considerable potential for improving global scale flood forecasting (improving NSE scores from 0 to 0.7 and beyond). Weakness in the model (e.g. structural problems and missing processes) and forcing that influence the performance will be highlighted.