A flexible open data assimilation framework for hydrological modelling

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Traditionally, data assimilation algorithms are implemented in model specific form. This requires in-depth knowledge of the numerical core and additional programming to perform data assimilation experiments. We present a more flexible approach to setup a hydrological forecasting system using a generic coupling between the Open Model Interface (OpenMI) and the model interface of OpenDA. OpenMI is used for all interactions between the model and the data assimilation algorithms avoiding the need to alter the computational core of the hydrological model. OpenDA is an open source data assimilation toolbox that contains a number of state-of-the-art data assimilation algorithms to easily set up a forecasting system with data assimilation capabilities. The developed coupling allows users to run any OpenMI compliant model seamlessly in OpenDA.

A number of assimilation experiments with the MIKE SHE distributed and integrated hydrological modeling system is performed to demonstrate the capabilities of the coupled OpenMI – OpenDA approach. Various ensemble based data assimilation algorithms are used to improve the forecasted groundwater levels and river discharges. Biases in the measurements are detected and corrected by the generic bias correction module of OpenDA.