Geophysical Research Abstracts
Vol. 16, EGU2014-11651, 2014
EGU General Assembly 2014

Moving Horizon Estimation for Assimilating H-SAF Remote Sensing Data into the HBV Hydrological Model

Rodolfo Alvarado Montero (1), Dirk Schwanenberg (1), Peter Krahe (2), and Dmytro Lisniak (2)

(1) University of Duisburg-Essen, Essen, Germany (rodolfo.alvarado-montero@uni-due.de), (2) German Federal Institute of Hydology, Koblenz, Germany (krahe@bafg.de)

Data Assimilation is used to integrate amongst others remote sensing data into hydrological models for improving the lead time performance of streamflow forecasts in the context of operational hydrological forecasting systems. We present a variational approach based on Moving Horizon Estimation (MHE) in application to the semi-distributed hydrological model HBV. The integrated framework enables the modification of driving forces such as precipitation or temperature as well as state variables such as snow water equivalent, soil moisture or the upper and lower storage terms of the conceptual model. The assimilation uses data products from several sources, e.g. more detailed models, in-situ measurements of dense sensor networks or remote sensing data. In the latter case, it is aspired to use the snow and soil moisture products generated in the project HSAF (EUMETSAT Satellite Application Facility on Support to Operational Hydrology and Water Management). The main advantage of the novel approach is a highly flexible formulation of distance metrics for penalizing the introduction of noise into the model and the agreement between simulated and observed variables. Furthermore, the approach shows a high robustness as regards non-equidistant, noisy and sometimes missing data.

The performance of the new framework is verified for two data-dense test sites in Germany: the catchments of the upper Main River (2419 km2) and Nahe River (1468 km2). Both HBV models show a good model performance with a Nash-Sutcliffe model efficiency above 0.9. In a first test suite, we verify the novel data assimilation framework by introducing noise to the model inputs. Whereas the forecast based on the state of the assimilated model nearly keeps its performance, we see a significant performance loss in the forecast based on the non-assimilated model. In another suite of tests, we validate in particular the HSAF data products as inputs of the data assimilation by assessing the forecast performance of the non-assimilated and assimilated models.