Geophysical Research Abstracts
Vol. 12, EGU2010-4029, 2010
EGU General Assembly 2010

Using added value of weather radar rainfall estimates with regard to hydrological lumped modeling

R. Krier (1), K. Görgen (1), P. Matgen (1), L. Pfister (1), S. Uhlenbrook (3), and H.H.G Savenije (2)

(1) CRP Gabriel Lippmann, Environnement et Agro-biotechnologies (EVA), Luxembourg (rkrier@lippmann.lu), (2) Delft University of Technology – Department of Water Management, Delft, The Netherlands, (3) UNESCO-IHE - Institute of Water Education, Delft, The Netherlands

The uncertainty associated with precipitation observations largely influences the performance of rainfall-runoff models. In this study we present results of a procedure that consists in integrating the spatial distribution of rainfall provided by radar data with lumped hydrological models. The study area is the well-equipped meso-scale catchment of the Alzette River in the Grand Duchy of Luxembourg. The rainfall data that is used are radar rainfall estimations from the German Weather Service (RADOLAN dataset). The proposed two step approach consists in generating a flow path distance map of the catchment based on a DEM and in using rainfall pattern in order to calculate for each time step mean weighted flow path distances of the water routing from the location of rainfall to the catchment outlet. By putting those weighted mean distances into relation with the general catchment mean flow distance, we are able to calculate a weighted mean flow path distance ratio for a specific rainfield at a specific time step. The resulting ratio time series include the information of the spatial distribution of the rainfall and its movement inside the catchment. These ratios can be used to sequentially adapt the time lag function of a lumped model, thereby implementing information on the time space distribution of rainfall in a non-spatially distributed hydrological lumped model. The model setup is calibrated using a multiobjective optimization approach with a focus on the timing of simulated discharge and based on the concept of Pareto optimality. The two objective functions are the correlation coefficient R and the coefficient of determination R2. Results of first applications of the method on the Alzette catchment and by using the FLEX lumped model show that the weighted mean distance ratios significantly impacts the routing of flood hydrographs and may thus be considered as a promising approach for improving the prediction of the timing and magnitude of floods.