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Sharing hydrological knowledge: an international comparison of hydrological models in the Meuse River Basin

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International collaboration between institutes and universities working and studying the same transboundary basin is needed for consensus building around possible effects of climate change and climate adaptation measures. Education, experience and expert knowledge of the hydrological community have resulted in the development of a great variety of model concepts, calibration and analysis techniques. Intercomparison could be a first step into consensus modeling or an ensemble based modeling strategy. Besides these practical objectives, such an intercomparison offers the opportunity to explore different ranges of models and learn from each other, hopefully increasing the insight into the hydrological processes that play a role in the transboundary basin. In this experiment, different international research groups applied their rainfall-runoff model in the Ourthe, a Belgium sub-catchment of the Meuse. Data preparation involved the interpolation of hourly precipitation station data collected and owned by the Service Public de Wallonie[1] and the freely available E-OBS dataset for daily temperature (Haylock et al., 2008). Daily temperature was disaggregated to hourly values and potential evaporation was derived with the Hargreaves formula. The data was made available to the researchers through an FTP server. The protocol for the modeling involved a split-sample calibration and validation for pre-defined periods. Objective functions for calibration were fixed but the calibration algorithm was a free choice of the research groups. The selection of calibration algorithm was considered model dependent because lumped as well as computationally less efficient distributed models were used. For each model, an ensemble of best performing parameter sets was selected and several performance metrics enabled to assess the models' abilities to simulate discharge. The aim of this experiment is to identify those model components and structures that increase model performance and may best represent the catchment's hydrological behavior. Further steps in the collaboration may include (1) repeating the experiment for other sub-catchments of the Meuse River Basin where different hydrological processes may be relevant and where other models may perform better; and (2) the comparison of hydrological model results obtained by forcing the model with daily local measured precipitation and lower resolution gridded precipitation from the E-OBS (Haylock et at., 2008) dataset to estimate the value of high-resolution data versus lower resolution gridded products.

[1] Service Publique de Wallonie, Direction générale opérationnelle de la Mobilité et des Voies hydrauliques, Département des Etudes et de l'Appui à la Gestion, Direction de la Gestion hydrologique intégrée, Boulevard du Nord 8 – 5000 Namur

"Haylock, M.R., N. Hofstra, A.M.G. Klein Tank, E.J. Klok, P.D. Jones and M. New. 2008: A European daily high-resolution gridded dataset of surface temperature and precipitation. J. Geophys. Res (Atmospheres), 113, D20119, doi:10.1029/2008JD10201"