



Assessment of future changes in Meuse discharge extremes

Frederiek Sperna Weiland (1), Adri Buishand (2), Philip Kraaijenbrink (2), Astrid Ruiten (2), Saskia van Pelt (3), Jaap Schellekens (1), and Jules Beersma (2)

(1) Deltares, Netherlands, (2) Royal Netherlands Meteorological Institute (KNMI), The Netherlands, (3) Earth System Science and Climate Change Group, WageningenUR, The Netherlands

The Meuse river forms a major link between France, Belgium, Luxembourg, Germany and the Netherlands. Climate change is expected to affect discharge extremes, both floods and droughts. Despite a few recent studies on climate changes impacts for the Meuse (e.g. the INTERREG project AMICE), consistent international hydrological scenarios for the basin are still to be developed.

In this study we make use of recently released global climate model (GCM) data of the IPCC 5th assessment report (i.e. the CMIP5 GCM data). An advanced delta change method has been developed at the Royal Netherlands Meteorological Institute (KNMI) where the climate responses of GCMs are used to modify observed precipitation and temperature time series. In addition to changes in temporal means, this method considers changes in variability thereby allowing for an analysis of the effects of changes in future precipitation extremes. The method efficiently generates future precipitation and temperature time-series for an ensemble of GCMs on the sub-catchment scale. To analyze the influence of climate change on river discharge the HBV model was re-calibrated with the SCE algorithm implemented in the Open-source Data Assimilation toolbox (OpenDA) using the reference precipitation and temperature time-series. In a second step, the HBV model was run with the perturbed precipitation and temperature time-series generated with the advanced delta change approach using the future GCM datasets. The resulting discharge time-series provide insight into the changes in discharge extremes, which in combination with the large ensemble of the CMIP5 GCMs can be used to make an uncertainty analysis of future changes in discharge extremes.

The current study is a first step towards a collaboration between universities, research institutes and governmental organizations in the Meuse countries – the Vue de Meuse initiative. This will allow for the improvement of existing hydrological climate scenarios targeted to trans-boundary water management in the Meuse basin and further analysis of the uncertainties related to the use of different hydrological models and down-scaling methods.