Geophysical Research Abstracts
Vol. 19, EGU2017-2427, 2017
EGU General Assembly 2017

Mapping (un)certainties in the sign of hydrological projections

Lieke Melsen (1), Nans Addor (2), Naoki Mizukami (2), Andrew Newman (2), Paul Torfs (1), Martyn Clark (2), Remko Uijlenhoet (1), and Ryan Teuling (1)

(1) Wageningen University, Hydrology and Quantitative Water Management, Wageningen, Netherlands (lieke.melsen@wur.nl), (2) NCAR, Boulder (CO), USA

While hydrological projections are of vital importance, particularly for water infrastructure design and food production, they are also prone to different sources of uncertainty. Using a multi-model set-up we investigated the uncertainty in hydrological projections for the period 2070-2100 associated with the parameterization of hydrological models, hydrological model structure, and General Circulation Models (GCMs) needed to force the hydrological model, for 605 basins throughout the contiguous United States. The use of such a large sample of basins gave us the opportunity to recognize spatial patterns in the results, and to attribute the uncertainty to particular hydrological processes. We investigated the sign of the projected change in mean annual runoff. The parameterization influenced the sign of change in 5 to 34% of the basins, depending on the hydrological model and GCM forcing. The hydrological model structure led to uncertainty in the sign of the change in 13 to 26% of the basins, depending on GCM forcing. This uncertainty could largely be attributed to the conceptualization of snow processes in the hydrological models. In 14% of the basins, none of the hydrological models was behavioural, which could be related to catchments with high aridity and intermittent flow behaviour. In 41 to 69% of the basins, the sign of the change was uncertain due to GCM forcing, which could be attributed to disagreement among the climate models regarding the projected change in precipitation. The results demonstrate that even the sign of change in mean annual runoff is highly uncertain in the majority of the investigated basins. If we want to use hydrological projections for water management purposes, including the design of water infrastructure, we clearly need to increase our understanding of climate and hydrological processes and their feedbacks.