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Global scale impacts of climate change on hydrological regimes

F.C. Sperna Weiland (1,2), L.P.H. van Beek (1), J.C.J Kwadijk (2), M.F.P Bierkens (1,3)

(1) Department of physical geography, Utrecht University, Utrecht, The Netherlands (frederiek.sperna@deltares.nl), (2) Inland Water Systems, Deltares, Delft, The Netherlands, (3) Subsurface and Groundwater Systems, Deltares, Utrecht, The Netherlands

Multiple studies investigating the hydrological consequences of climate change on a global scale have been conducted. However, projected changes and discharge quantities differ per GCM and therefore, besides information on (mean) direction of change, the likelihood of change is of great interest. In this study meteorological data from twelve GCMs (SRES scenarios A2, A1B and control experiment 20CM3) is used to force the global hydrological model PCR-GLOBWB in order to calculate discharge change. In addition to previous studies we quantified the significance and consistency of projected change and its spatial and temporal variability by integrating: 1) spatial and temporal patterns of change in regimes, 2) significance of change relative to the natural variability and the inter-model spread and 3) consistency of change between models. The resulting consistency maps reveal in which regions of the world the likelihood for hydrological change is large.
Differences in predicted change between emission scenarios are small, whereas the results for the different GCMs diverge widely. Despite discrepancies amongst models, consistent results were found: By 2100 the GCMs predict a consistent decrease in runoff for southern Europe, southern Australia, parts of Africa and southwestern South-America. Discharge of Monsoon influenced rivers slightly increases, while in the Arctic regions runoff increases and regimes show a phase shift with peaks occurring earlier in time.