Geophysical Research Abstracts
Vol. 20, EGU2018-10011, 2018
EGU General Assembly 2018

Simulating Streamflow in Ungauged Basins under a Changing Climate: The Importance of Landscape Characteristics

Claudia Teutschbein (1), Thomas Grabs (1), Hjalmar Laudon (2), Reinert Karlsen (1), and Kevin Bishop (3)

(1) Uppsala University, Department of Earth Sciences, Uppsala, Sweden (claudia.teutschbein@geo.uu.se), (2) Swedish University of Agricultural Sciences, Department of Forest Ecology and Management, Umeå, Sweden, (3) Swedish University of Agricultural Sciences, Department of Aquatic Sciences and Assessment, Uppsala, Sweden

Different landscape characteristics such as topography, geology, soils and land cover are known to control hydrological behavior of catchments under the same (stationary) climate conditions. Their complex interactions and their combined influence on streamflow, however, are not well understood, especially in the context of climate shifts. Based on the analysis of 14 neighboring and rather similar catchments in Northern Sweden, we demonstrate in this contribution that landscape characteristics are not only important under stationary climate conditions, but also play a fundamental role for the sensitivity of a catchment to changing climate conditions. An ensemble of 15 regional climate models bias-corrected with a distribution-mapping approach was used to simulate present and future streamflow in each catchment with the HBV model. We show that a regionalization approach can be applied to establish significant functional relationships between different landscape forms and hydrological shifts in a changing climate, which in turn can be used to predict the combined effects of changes in physical catchment and climate conditions on hydrological processes in an ungauged basin. Our analysis shows a strong connection between the forest cover extent and the sensitivity of a catchment's hydrological response to changing climate conditions. Further research is still necessary to increase our understanding of how other landscape forms contribute to future streamflow changes, which is key to quantifying the combined impacts of landuse and climate change on storage and release of water as well as on nutrient cycling.