Geophysical Research Abstracts
Vol. 20, EGU2018-8585, 2018
EGU General Assembly 2018

Regional scaling of annual mean precipitation and water availability with global temperature change

Peter Greve (1,2), Lukas Gudmundsson (2), and Sonia I. Seneviratne (2)

(1) IIASA, Water Program, Laxenburg, Austria (greve@iiasa.ac.at), (2) Institute for Atmospheric and Climate Science, ETH Zurich, Switzerland

Changes in regional water availability belong to the most crucial potential impacts of anthropogenic climate change,but are highly uncertain. It is thus of key importance for stakeholders to assess the possible implications of different global temperature thresholds on these quantities. Using a subset of climate model simulations from the 5th phase of the Coupled Modeling Intercomparison Project (CMIP5), we derive here the sensitivity of regional changes in precipitation and precipitation minus evapotranspiration to global temperature changes. The simulations span the full range of available emissions scenarios and the sensitivities are derived using a modified pattern scaling approach. The applied approach assumes linear relationships on global temperature changes while thoroughly addressing associated uncertainties via resampling methods. This allows us to assess the full distribution of the simulations in a probabilistic sense. Northern high latitude regions display robust responses towards a wetting, while subtropical regions display a tendency towards drying but with a large range of responses. Even though both internal variability and the scenario choice play an important role in the overall spread of the simulations, the uncertainty stemming from the climate model choice usually accounts for about half of the total uncertainty in most regions. We additionally assess the implications of limiting global mean temperature warming to values below (i) 2K or (ii) 1.5K (as stated within the 2015 Paris Agreement). We show that opting for the 1.5K-target might just slightly influence the mean response, but could substantially reduce the risk of experiencing extreme changes in regional water availability.