Geophysical Research Abstracts
Vol. 18, EGU2016-16663, 2016
EGU General Assembly 2016

Looking at the spatial and temporal distribution of global water availability and demand

Peter Burek (1), Yusuke Satoh (1), Yoshihide Wada (2,3,4), Martina Floerke (5), Stefanie Eisner (5), Naota Hanasaki (6), and David Wiberg (7)

(1) IIASA, Water, Austria (burek@iiasa.ac.at), (2) Department of Physical Geography, Utrecht University, Utrecht, The Netherlands, (3) NASA Goddard Institute for Space Studies, 2880 Broadway, New York, NY 10025, USA, (4) Center for Climate Systems Research, Columbia University, 2880 Broadway, New York, NY 10025, USA, (5) Center for Environmental Systems Research, University of Kassel, Kassel, Germany, (6) National Institute for Environmental Studies, Tsukuba, Japan, (7) International Water Management Institute, Colombo, Sri Lanka

The human water demand for agriculture, industry, energy and domestic is less than ten per cent of the global freshwater production of around 54,000 km3 per year. Water is distributed unequally in time and space. Not a new insight, but when we zoom in and look at country and regional level and monthly time scale the global picture is dispatching into areas and periods of water abundance and water scarcity, which we can quantify.

This study uses the multi-model approach of the Inter-Sectoral Impact Model Intercomparison Project (ISI-MIP) to build up a consistent set of global water scenarios based on Shared Socioeconomic Pathways (SSPs) and Representative Concentration Pathways (RCPs) for the IIASA Water Futures and Solutions Initiative (WFaS). The WFaS "fast-track" assessment applies three water scenarios based on feasible combinations of two different RCPs and three SSPs, then five different hydrological models are used to estimate water availability and three water use models to estimate water demand from different sectors.

Results are shown as indicators for e.g. water stress and water dependency between countries for present time and for future projections up to 2050. The alterations to previous studies are the multi-model approach and the finer temporal monthly scale, showing the temporal and spatial diversity of water demand and availability.

One example scenario is based on the combination of SSP2 and RCP6.0. While in 2010 17 countries out of 249 facing severe water stress on an annual basis, the number is likely to increase up to 26 countries by 2050. Looking at the monthly time dimension 51 countries with altogether 3.8 billion people are under severe water stress in at least one month in 2010. This will rise up to 57 countries and 4.9 billion people by 2050. Main driver of this development will be the rising water demand of a growing population and to a lesser extend the changing distribution of water availability.

Model biases are inevitable in meteorology and hydrology, therefore we use a multi-model approach for greater confidence in model results and to estimate uncertainties due to scenario and model bias. This study also shows the variability across the scenarios and models.