Geophysical Research Abstracts
Vol. 19, EGU2017-10863, 2017
EGU General Assembly 2017

Assessing surface water availability considering human water use and projected climate variability

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Climate variability along with anthropogenic activities alter the hydrological cycle and local water availability. The overarching goal of this presentation is to demonstrate the compounding interactions between human water use/withdrawals and climate change and variability. We focus on Karkheh River basin and Urmia basin, in western Iran, that have high level of human activity and water use, and suffer from low water productivity. The future of these basins and their growth relies on sustainable water resources and hence, requires a holistic, basin-wide management to cope with water scarcity challenges. In this study, we investigate changes in the hydrology of the basin including human-induced alterations of the system, during the past three decades. Then, we investigate the individual and combined effects of climate variability and human water withdrawals on surface water storage in the 21st century. We use bias-corrected historical simulations and future projections from ensemble mean of eleven General Circulation Models (GCMs) under two climate change scenarios RCP4.5 and RCP8.5. The results show that, hydrology of the studied basins are significantly dominated by human activities over the baseline period (1976 – 2005). Results show that the increased anthropogenic water demand resulting from substantial socio-economic growth in the past three decades have put significant stress on water resources. We evaluate a number of future water demand scenarios and their interactions with future climate projections. Our results show that by the end of the 21st century, the compounding effects of increased irrigation water demand and precipitation variability may lead to severe local water scarcity in these basins. Our study highlights the necessity for understanding and considering the compounding effects of human water use and future climate projections. Such studies would be useful for improving water management and developing adaption plans in water scarce regions.