Assessment of Ecohydrological Impacts Under Climate Change Scenarios from CMIP5

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Abstract

Terrestrial ecosystems are vulnerable to changes in the hydrological cycle induced by climate change. Changes in the frequency and intensity of hydrologic events, including droughts and floods, are suggested by global climate simulations with rising greenhouse gas concentrations. In addition, changes in the spatial and temporal distribution of precipitation can have significant impacts on the diversity and productivity of ecosystems. Routine assessment of model-projected changes in the hydrological cycle under various scenarios of climate change is necessary to understand possible impacts on water resources, carbon dioxide uptake and future carbon dioxide concentrations, and to plan adaptation strategies. A range of future climate change scenarios, called Representative Concentration Pathways (RCPs), prepared for the Fifth Climate Model Intercomparison Project (CMIP5) were employed as forcing for global climate simulations contributed to the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (AR5). We have applied a highly scalable data mining algorithm as a component of statistical analyses to results of model simulations using these RCPs as forcings. These statistical methods have been used to investigate salient features of projected changes in the global hydrological cycle from results from different CMIP5 models using the same RCPs. In particular, the frequency and intensity of major hydrological events in future projections and their potential impacts on natural ecosystems have been analyzed to identify areas of high vulnerability and potential future water stress. This analysis provides insight into projected change in distributions of water resources that may be useful for urban planning and climate change adaptation.