Geophysical Research Abstracts
Vol. 18, EGU2016-10011, 2016
EGU General Assembly 2016

Sources of Uncertainty in Climate Change Projections of Precipitation

Ethan Gutmann (1), Martyn Clark (1), Trude Eidhammer (1), Kyoko Ikeda (1), Clara Deser (2), Levi Brekke (3), Jeffrey Arnold (4), and Roy Rasmussen (1)

(1) Research Applications Lab, National Center for Atmospheric Research, Boulder, CO, United States, (2) Climate and Global Dynamics Lab, National Center for Atmospheric Research, Boulder, CO, United States, (3) U.S. Bureau of Reclamation Denver, CO, USA, (4) US Army Corps of Engineers Climate Preparedness and Resilience Programs

Predicting the likely changes in precipitation due to anthropogenic climate influences is one of the most important problems in earth science today. This problem is complicated by the enormous uncertainty in current predictions. Until all such sources of uncertainty are adequately addressed and quantified, we can not know what changes may be predictable, and which masked by the internal variability of the climate system itself. Here we assess multiple sources of uncertainty including those due to internal variability, climate model selection, emissions scenario, regional climate model physics, and statistical downscaling methods. This work focuses on the Colorado Rocky Mountains because these mountains serve as the water towers for much of the western United States, but the results are more broadly applicable, and results will be presented covering the Columbia River Basin and the California Sierra Nevadas as well. Internal variability is assessed using 30 members of the CESM Large Ensemble. Uncertainty due to the choice of climate models is assessed using 100 climate projections from the CMIP5 archive, including multiple emissions scenarios. Uncertainty due to regional climate model physics is assessed using a limited set of high-resolution Weather Research and Forecasting (WRF) model simulations in comparison to a larger multi-physics ensemble using the Intermediate Complexity Atmospheric Research (ICAR) model. Finally, statistical downscaling uncertainty is assessed using multiple statistical downscaling models. In near-term projections (25-35 years) internal variability is the largest source of uncertainty; however, over longer time scales (70-80 years) other sources of uncertainty become more important, with the importance of different sources of uncertainty varying depending on the metric assessed.