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The Colorado Headwaters Climate Change Project

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Snowpack is the most important water source in the western U.S., and thus it is critical that water managers be provided with as accurate as possible estimate of the likely changes expected of this resource in the future. Previous climate studies have shown that the Headwaters region of the Colorado river seems to be a particularly difficult area for climate model to handle, with inconsistent snowpack trends in this region from both the 3rd and 4th IPCC reports (2001, 2007), despite consistent prediction of temperature increases in this region from all climate models. In order to provide more realistic estimates of the hydro-climatic changes in this region, a high resolution modeling study has been initiated using the climate version of the NCAR Weather Research and Forecast model. A variety of studies have been conducted, including an assessment of the model resolution required to simulate snowfall and snowpack in this region, the sensitivity to choice of model parameterization including the microphysics, evaluation of changes in precipitation efficiency using higher resolution simulations, the impact of mesoscale circulations on the observed and projected snowpack, improvements to the simulation of the evolution of the snowpack, assessment of various downscaling approaches using global and regional climate models, and the expected runoff in a future warmer and moister world using the Water Evaluation and Planning (WEAP) model that takes into account built water resource infrastructures. The most recent analysis includes an assessment of the Nested Regional Climate Model WRF simulations of temperature and precipitation and predicted runoff over this region. This paper will provide some of the key results of this project regarding expected climate change impacts, including new results from the Nested Regional Climate Model.