Geophysical Research Abstracts
Vol. 16, EGU2014-16094, 2014
EGU General Assembly 2014

Modeling changes in extreme snowfall events in the Central Rocky Mountains Region with the Fully-Coupled WRF-Hydro Modeling System

David gochis, Roy rasmussen, Wei Yu, and Kyoko Ikeda
NCAR, United States (gochis@ucar.edu)

Modeling of extreme weather events often require very finely resolved treatment of atmospheric circulation structures in order to produce and localize large magnitudes of moisture fluxes that result in extreme precipitation. This is particularly true for cool season orographic precipitation processes where the representation of landform can significantly influence vertical velocity profiles and cloud moisture entrainment rates. In this work we report on recent progress in high resolution regional climate modeling of the Colorado Headwaters region using an updated version of the Weather Research and Forecasting (WRF) model and a hydrological extension package called WRF-Hydro. Previous work has shown that the WRF-Hydro modeling system forced by high resolution WRF model output can produce credible depictions of winter orographic precipitation and resultant monthly and annual river flows. Here we present results from a detailed study of an extreme springtime snowfall event that occurred along the Colorado Front Range in March of 2003. First an analysis of the simulated streamflows resulting from the melt out of that event are presented followed by an analysis of projected streamflows from the event where the atmospheric forcing in the WRF model is perturbed using the Psuedo-Global-Warming (PGW) perturbation methodology. Results from the impact of warming on total precipitation, snow-rain partitioning and surface hydrological fluxes (evapotranspiration and runoff) will be discussed in the context of how potential changes in temperature impact the amount of precipitation, the phase of precipitation (rain vs. snow) and the timing and amplitude of streamflow responses. It is shown that under the assumptions of the PGW method, intense precipitation rates increase during the event and, more importantly, that more precipitation falls as rain versus snow which significantly amplifies the runoff response from one where runoff is produced gradually to where runoff is more rapidly translated into streamflow values that approach significant flooding risks.