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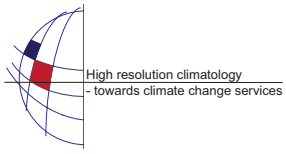

Precipitation efficiency of the Colorado mountains under warmed climate

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The analysis to date of high-resolution simulations of seasonal snowfall over Colorado Headwaters region under the current and future warmed climate conditions show the increase of precipitation on the order of 25% over a large model domain covering a large portion of the western US and about 10% in the high-elevation parts of the Colorado Headwaters region (Rassmussen et al. 2010). Both of these numbers are higher than 4-7% increase predicted by global models over the same region. In this study we examine the efficiency of mountains in the Colorado Headwaters region in producing the orographic precipitation and how that efficiency changes under the warmed climate conditions. The important elements in the pathway to orographic precipitation are: i) the availability and spatial distribution of water vapor, and ii) the dynamic forcing including the large-scale flow as well as its orographic modification. The precipitation efficiency is examined through water vapor flux, which, as an integral quantity, reflects the effect of both the water vapor mixing ratio as well as the horizontal wind. The analysis is based on high-resolution climate-runoff simulations for the Colorado Headwaters region for the current and future warmed climate for four water years, one dry (2001/2002), two average (2003/2004 and 2005/2006) and one wet year (2007/2008), exploiting the Pseudo-Global-Warming (PGW) approach for the future climate simulations.