

## **Sensitivity of the Himalayan orography representation in simulation of winter precipitation using Regional Climate Model (RegCM) nested in a GCM**

P.R. Tiwari, S. C. Kar, U. C. Mohanty, S. Dey, P. Sinha, and M. S. Shekhar  
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**Abstract:** The role of the Himalayan orography representation in a Regional Climate Model (RegCM4) nested in NCMRWF global spectral model is examined in simulating the winter circulation and associated precipitation over the Northwest India (NWI; 23°6'37.5"N and 69°6'85"E) region. For this purpose, nine different sets of orography representations for nine distinct precipitation years (three years each for wet, normal and dry) have been considered by increasing (decreasing) 5, 10, 15, and 20% from the mean height (CNTRL) of the Himalaya in RegCM4 model. Validation with various observations revealed a good improvement in reproducing the precipitation intensity and distribution with increased model height compared to the results obtained from CNTRL and reduced orography experiments. Further it has been found that, increase in height by 10% (P10) increases seasonal precipitation about 20%, while decrease in height by 10% (M10) results around 28% reduction in seasonal precipitation as compared to CNTRL experiment over NWI region. This improvement in precipitation simulation comes due to better representation of vertical pressure velocity and moisture transport as these factors play an important role in wintertime precipitation processes over NWI region. Furthermore, a comparison of model-simulated precipitation with observed precipitation at 17 station locations has been also carried out. Overall, the results suggest that when the orographic increment of 10% (P10) is applied on RegCM4 model, it has better skill in simulating the precipitation over the NWI region and this model is a useful tool for further regional downscaling studies.