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Precipitation and snow cover in the Himalayas: from reanalyses to climate regional simulations

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We performed simulations over the Himalayas with the regional climate model "MAR" for the period 2000-2002. The centre of the domain is located in Nepal and was chosen to describe as best as possible regional convective processes depending on local meteorological conditions and topography, but also to correctly simulate large-scale processes. We investigated the improvements obtained with the MAR simulations in comparison with the ERA-INTERIM reanalysis. The spatial heterogeneity of wind, moisture transport, and precipitation appears more realistic when simulated in the 20 km resolved simulation in comparison with the 80 km grid estimation of the ERA-INTERIM reanalysis. However, our regional model reproduces – and sometime amplifies – the major biases of ERA-INTERIM precipitation. Evaluating real precipitation rates in this region is, however, very difficult due to large differences existing between different observations, in particular between local network measurements and satellite products. The high resolution of our model appears essential to correctly describe snowfall and snow cover, which are poorly represented in the ERA-INTERIM reanalysis. Our model reproduces quite well the number of days with snow on the ground determined from satellite observations. Based on our simulations, we found snow cover to have a strong seasonal cycle in the western and eastern parts of the Himalayas, whereas it has no clear seasonal variations in central Himalayas depending both on summer monsoon and western low pressure systems.