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Influence of meteorological forcing data on the hydrological modelling in a high-altitude, glaciated catchment (Dudh Koshi, Nepalese Himalaya)

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Assessing climate forcing and understanding hydro-meteorological processes in high altitude and glaciated catchments are key issues to estimate the future water resource availability in downstream regions and requires reliable climate data and better knowledge.
The hydrological response of mountain catchments such as the Dudh Koshi River, a tributary to the Gange River situated in Nepal, strongly depends on high altitude diurnal and seasonal meteorological cycles. One of the main challenges in hydrological modelling is to constitute a reliable meteorological forcing data set. Although many meteorological data products are available for the Himalayas, these products show substantial differences. Because of the lack of in situ data at high altitudes and due to the complex topography, spatializing local meteorological data over a catchment can lead to large errors. This study aims to show the influence of the meteorological forcing data and the spatial extrapolation of air temperature and precipitation on the simulated runoff and snow cover dynamics.
For our comparison we used four meteorological data sets from in-situ observation, satellite (TRMM) and reanalysis (ERA-Interim and High Asia Reanalysis) data for the small Upper Dudh Koshi sub-catchment with an area of 150 km^2 of which 40% is glaciated. These meteorological data sets show significant disparities, especially concerning precipitation data; ERA-Interim and TRMM annual cumulative precipitation data appear to be largely higher than HAR and in-situ observations. We show that the distribution between snowfall and rainfall derived from the precipitation data and a snow temperature threshold varies from one data set to another. We further used the distributed physically based glacio-hydrological model DHSVM-GDM, which includes snow cover and glacier dynamics, to test the model sensitivity with respect to the meteorological forcing data. The results of these sensitivity studies will be presented.