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Regional climate modelization over an Andean glacier region (Antizana, Ecuador)

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The glaciers evolution in the Tropical Andes is determined by several processes, one of the most important being the precipitation variability. Therefore, better understanding the precipitation spatio-temporal variability in these regions is crucial. In this study we focus on the Antisana ice cap, located in the Equatorial Andes about 50 km of Quito city (Ecuador). The meteorological in-situ stations in the Antisana region are scarce due to the complexity of the topography. In this context, Regional Climate Models (RCMs) are useful to better understand the local climate dynamics by running simulations with high spatio-temporal resolutions.
In this study the Weather Research Forecasting (WRF) model is used to simulate the atmospheric regional climate, including precipitation (liquid, solid) and meteorological variables for the year 2005. The WRF model is used with four nested domains. The simulation in the last domain (1kmx1km) is used for this study. The in-situ data registered in the Antizana meteorological station (SNO GLACIOCLIM, LMI GREATICE) are compared with the closest 1 km grid point of the WRF simulations. Different options of external forcing data, dynamical and physical parameterizations were tested in order to identify the parameters that provided the better precipitation results. We show that the simulations are improved when compared to the Antisana in-situ data, when the SRTM digital elevation model is used instead of the USGS data as topography forcing. Different configuration of cumulus scheme and microphysical schemes are also tested and evaluated in terms of occurrence and intensity patterns of precipitation. We also identify local atmospheric processes influencing the precipitation diurnal cycle, as moisture transport and thermally driven valley circulations.