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SPATIO-TEMPORAL VARIABILITY OF WRF PRECIPITATION ASSOCIATED WITH THE REGIONAL AND LOCAL CIRCULATION IN THE TROPICAL ANDES (RIO SANTA BASIN, PERU)

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RESUMO

The estimation of precipitation in Tropical Andes is challenging for the low temporal scale of satellite data and the limited number of in-situ measurements. The precipitations patterns in the Tropical Andes region is important especially in the Santa Basin where the agriculture, hydrology, and glacier formation are strongly influence for this variable. The precipitation variability over the basin is associated with the large-scale circulation that establish the climatological conditions in the summer of Tropical South American. Satellite (product 3B42 of Tropical Rainfall Measuring Mission), in-situ observations and atmospheric model outputs (WRF-Weather Research and Forecasting), are compared for one month to evaluate the temporal and spatial distribution of precipitation that is the main objective. ERA5 reanalysis data is used to drive one domain with a horizontal grid size 5km. ERA5 data with 30km of horizontal grid size allow getting high-resolution simulation without applying nesting in the WRF which is convenient to computational cost. In addition, different parameterization schemes are applying to the simulations to evaluate the differences of each other. WRF simulations overestimate the precipitation while reproducing correctly the longitudinal precipitation patterns between the Amazon, convective rainfall over the Andes and dry conditions in the coast in Peru. The precipitation is more intense over the basin valley during the night by the influence of east flux that transports the moisture from the Amazon. The intensification of this flux is associated to the presence of strong northerly winds in the east side of the Andes. The study demonstrates that different experiments show different patterns of large-scale circulation that is strongly associated with the adequate simulation of the precipitation diurnal cycle in the basin by the model. The presence by Goddard (microphysics), Betts-Miller-Janjic (cumulus parameterization) and Mellor–Yamada–Nakanishi–Niino Level 2(planetary boundary layer) improve considerably the simulation of the precipitation diurnal cycle, representing more parallel winds in the east of the Andes. In contrast, the other experiments simulate perpendicular winds to the east side of the Andes, showing the maxima precipitation many hours late compared to observations by meteorological stations.