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Summertime precipitation deficits in the Peruvian highlands for station data, reanalyses and model simulations

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Precipitation deficits are a concern to the rural population in the southern Peruvian highlands and knowledge about their occurrence is lacking amongst other because of scarce data availability. The Climandes project, a pilot project of the Global Framework for Climate Services, aims at tackling this concern by evaluating available data and elaborating and providing climate services for the southern Peruvian highlands.
For mountainous regions with a sparse station network, reanalyses can provide valuable information on past drought events; however known limitations in reproducing precipitation may be aggravated due to unresolved topographical effects. In this study, we assess in a first step the representation of precipitation in seven reanalysis datasets in comparison to station observations and a newly generated gridded precipitation dataset for Peru using standard measures. In a second step, we assess summer precipitation deficits in Peru during the second half of the 20th century and analyze sources of their variability.
In the reanalyses datasets, we find biases strongly influenced by the topography of the models and low correlations for the rainy season. Thus, current reanalyses do not solve the problem of data scarcity for this region. Based on observational records and reanalyses, a considerable fraction of interannual variability of precipitation can be explained through upper-tropospheric zonal wind, which in turn can be modulated by El Niño. This confirms that El Niño is not a sufficient stratification criterion for the occurrence of precipitation deficits during the rainy season, but our results suggest that the flavor of an El Niño event matters.