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Influence of Sea Surface Temperature Anomalies in the tropical Atlantic and the East-Central Pacific on Precipitation Variability in the Central Andes (13°S – 18°S)

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The Andean mountain range is a climatic barrier that blocks low-level tropospheric circulations. The resulting two contrasts of precipitation are most pronounced in its tropical part. The transition between both contrasts takes place in the high Andes along a transitional precipitation gradient. A few studies have shown that spatio-temporal precipitation patterns of the tropical Andes were related to the Sea Surface Temperature (SST) either of the Pacific or the Atlantic, but the magnitude and resulting spatial precipitation patterns are still in question. This study identifies spatio-temporal precipitation patterns that are highly correlated to time-delayed monthly SST-anomalies in both oceanic regions. The analysis was based on precipitation data from the Tropical Rainfall Measuring Mission (TRMM). Time series of monthly SST-anomalies were derived from the East-Central Tropical Pacific (Niño 3.4) and the Tropical Southern Atlantic (TSA). Precipitation data were filtered by applying wind direction filters at different tropospheric pressure levels derived from ERA-Interim. Highly significant ($p<0.01$) coefficients of determination up to 0.8 were found by multiple linear correlations using both data-sets of SST-anomalies as predictors for precipitation in austral summer (December to February: DJF). The strongest relationship was found in the semi-arid West Cordillera of the Andes within the study region. Here, a time-lag of one month in Pacific SST-anomalies reviled forecast potential for precipitation in DJF. A 61-year time series of DJF precipitation was computed based on the derived regression function. The results indicated a negative trend in computed DJF precipitation of - 1.2 mm per year due to a significant positive trend of January SST-anomalies in the Tropical South Atlantic.