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Long-term variability of central Andes precipitation in the IPSL-CM6A-LR model: origin and causes.

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The central Andes have undergone a drying trend over the last decades with adverse socioeconomic effects throughout the south of Argentina and Chile. The long-term precipitation variability in this region has been associated with modes of sea surface temperature (SST) and atmospheric circulation variability acting at decadal-to-multidecadal timescales, such as the Interdecadal Pacific Oscillation and the Southern Annular Mode. More recently, the drying long-term trend of precipitation in central Andes has also been linked to a poleward expansion of the Hadley Cell (HC) in the Southern Hemisphere over the last decades. In previous works several possible causes of the HC expansion have been proposed, involving both external forcing (e.g., greenhouse gases and ozone depletion effects) and internal climate variability (e.g., SST and atmospheric modes).

In this work the origin and the causes of the central Andes precipitation variability at decadal-to-longer time scales are studied. For this purpose, the main modes of climate variability that modulate the central Andes precipitation are first identified. Then the changes of these modes and their influence on precipitation are attributed to different factors of external forcing or to internal climate variability. For this analysis large ensembles of different climate simulations and detection-and-attribution experiments performed with the IPSL-CM6A-LR model are used.