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The expanding tropics impact on central Andes precipitation.

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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 (SH) 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 relationship between the HC extent in the SH and the precipitation variability in central Andes at decadal-to-multidecadal timescales is evaluated. For the analysis historical simulations of the Atmospheric Model Intercomparison Project phase 6 (AMIP6) of the IPSL-CM6A-LR model are used. The HC expansion in the SH is characterized using the zonal mean meridional mass streamfunction at 500 hPa to identify the mechanisms involved in the link with precipitation. The principal modes of decadal-to-multidecadal climate variability affecting the HC extent are also identified and characterized to detect the causes and dynamical processes that explain the HC expansion and the central Andes drying trend over the last decades.