

# **Climate Variability in Southern South America Associated with El Niño and La Niña Events**

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## **ABSTRACT**

A comprehensive view is given of the precipitation and circulation anomalies associated with the various stages of El Niño (EN) and La Niña (LN) events all over Southern South America (SSA). This view comprises the delineation of coherent regions with respect to precipitation anomalies, the identification of the seasons of maximum anomalies, the indication of their magnitude and the assessment of their consistency during those events. Besides, the spatial and temporal variability of these anomalies is detailed by calculating the expected precipitation percentiles and the consistency of wet and dry anomalies for each station and each three-month running season during EN and LN cycles. Composites of circulation anomalies and an assessment of their consistency are also presented and their connection with the precipitation anomalies is discussed.

Southern Brazil presents the strongest average signal in EN events. The general behavior towards opposite signals in the precipitation and circulation anomalies over SSA during almost the same periods of the EN and LN cycles indicates a large degree of linearity in the response to these events. The timing of the anomalies changes throughout SSA, leading to the identification of eight different coherent regions in the EN case and six in the LN case. This regionalization is mostly caused by different processes leading to precipitation anomalies in SSA during those events. All these regions show a significant response in some part of each cycle. Its magnitude and consistency show a large spatial variability and some areas present very strong and consistent anomalies sometimes not disclosed when large coherent regions are analyzed. In spite of the differences in timing, some features of the precipitation anomalies are rather uniform throughout the region during EN and LN events. In EN cycle, there is a tendency to lower than median precipitation in the year before the event, which continues until March of the year of the event. In a vast region, east of Andes, the strongest positive precipitation anomalies occur in spring of this year, when the circulation anomalies concur to enhance rainfall over several regions. During the summer of the mature stage the positive precipitation anomalies almost disappear and then reappear in some regions in late summer-early autumn and in winter of the year following the starting year of the event. This description holds partially for the LN cycle, but with opposite signs, although there is a larger spatial variability in the LN-related anomalies in the following year, and some shifts in timing. As for precipitation, the symmetry of the geopotential height anomaly fields with opposite signs between LN and EN cases is also remarkable, especially during the year (0).