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The Influence of the Atlantic Multidecadal Oscillation on the Eastern Andes Low-Level Jet and Precipitation in South America

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ABSTRACT

The South America low-level jet (SALLJ) on the eastern slopes of the Andes is a unique climatological feature in the continent. The SALLJ transports large amounts of moisture and controls the spatiotemporal variability of precipitation in southeast South America. This study shows a remarkable influence of the Atlantic Multidecadal Oscillation (AMO) on decadal-to-multidecadal variability of the SALLJ. The results show a consistent pattern in which active SALLJ days during negative AMO phases are associated with negative precipitation anomalies over northern Amazon and the Atlantic Intertropical Convergence Zone (ITCZ). Increased cross-equatorial flow over northwestern South America combined with the outflow associated with the atmospheric subsidence over the negative precipitation anomalies enhances northerly winds along the eastern slopes of the Andes and Amazon. This atmospheric circulation response, which is more prevalent in the austral winter, intensifies the SALLJ. In the exit region of the SALLJ over southern Brazil, Uruguay and northern Argentina, an anomalous low-level cyclonic circulation is associated with enhanced precipitation. The influence of the AMO on the SALLJ is consistent with paleo-proxy studies showing multidecadal changes in precipitation over the La Plata River drainage basin. The analysis shows that secular trends reinforce the SALLJ and precipitation patterns. Moreover, the study highlights the importance of natural variability (*i.e.*, decadal-multidecadal variations) occurring within long-term trends in the mean state, possibly associated with global warming, and significant changes in the SALLJ and precipitation over South America.

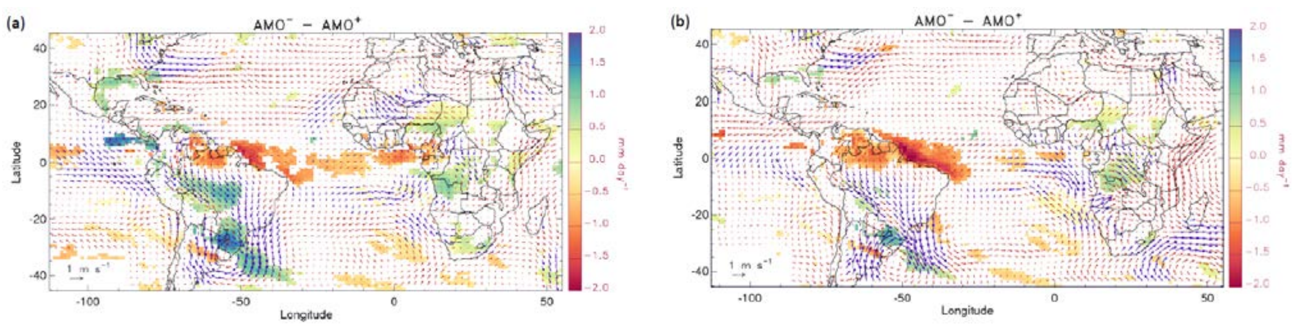

Fig. 1 a) Differences in mean winds (850-hPa) and precipitation during SALLJ days between negative (Nov 1965–Aug 1996) and positive (Sep1924–Oct 1965) AMO phases. Time series of winds and precipitation contain linear trends. b) As in (a), but linear trends in winds and precipitation have been removed before calculating the difference between negative and positive AMO phases. Vectors in blue colors are statistically significant at 5% confidence; vectors in red are not statistically significant. Vector scale is shown in the inset. Shading shows statistically significant (5% level) differences in mean precipitation.

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Reference

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