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El Niño/Southern Oscillation induced monthly oscillations of precipitation: The unique case of the South Tropical Indian Ocean

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Seasonal (three-month average) climate forecasts have advanced due in large part to improved modeling of the ENSO phenomenon. Long-range monthly forecasts are more problematic because of internal atmospheric variability. Further, it is often assumed that monthly precipitation anomalies are representative of the overall seasonal anomaly. This is not always the case as, according to the Global Precipitation Climatology Project Version 2.1 data set, up to 20% of areas demonstrating some significant teleconnection to ENSO show El Niño minus La Niña differences of one sign in the middle month and the opposite sign in the adjacent months. Most interestingly, this maximum percentage occurs in December-January-February (DJF), a time when the ENSO boundary forcing is strongest. These oscillatory DJF seasons also cluster in space - with significant positive-negative-positive differences in the western South Tropical Indian Ocean (STIO) and negative-positive-negative differences in the far eastern STIO. Representative gauges confirm that these precipitation patterns have been associated with ENSO events since 1951, and pentad precipitation data confirm that they are confined to DJF and evolve at the monthly scale. The abrupt end of the Indian Ocean Dipole mode in January, an increase in the importance of local SST anomalies in February, and an ENSO-induced mid-latitude Rossby wave during austral summer combine to generate the cross-basin precipitation gradient around 15oS.