



Teleconnections between the tropical Atlantic and Indian Oceans

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Similar to the Pacific Ocean the Atlantic Ocean hosts a Niño-like phenomenon with recurring anomalous sea surface temperature (SST) warming. Like their Pacific counterparts, Atlantic Niños have striking effects on the local ecosystems and regional rainfall, although they occur less frequent and less intense. Furthermore, recent studies show that their influence is not limited to the regional scale but may also be observed in remote regions such as the tropical Pacific Ocean. A lead-lag relationship between the Atlantic and Pacific Oceans with a time lag of 6 to 8 months (Atlantic leading) has been found, suggesting that a Pacific La Niña may be enhanced by a preceding Atlantic Niño in recent decades. While the main focus of previous studies lies on the teleconnections between the Atlantic and Pacific Oceans, this study analyzes the influence of Atlantic Niños on the two main modes of tropical Indian Ocean variability, namely the Indian Ocean Dipole (IOD) and the basin-wide mode.

As a first step, high-pass filtered SST indices are computed for the Atlantic, Pacific and Indian Oceans, representing Atlantic Niño, Pacific Niño, IOD and basin-wide mode respectively. Based on these indices, bivariate and partial correlation analyses are carried out to analyze the teleconnections between the Atlantic and Indian Oceans with respect to the dominant influence of the Pacific El Niño Southern Oscillation (ENSO) system. Due to the strong dependence of IOD and basin-wide mode events on ENSO events, an Atlantic influence on the tropical Indian Ocean is further analyzed in a case study of Pacific La Niñas (El Niños) with and without a preceding summer Atlantic Niño (Niña). For an analysis of both the SST anomalies and the overlaying atmospheric circulation, for each case composites of SSTs, sea level pressure, velocity potential and stream function are computed.

No significant links are found between the tropical Atlantic and Indian Oceans that are independent of ENSO. However, results indicate an ENSO-dependent link, suggesting that the Atlantic signal enhancing ENSO events is further propagated to the Indian Ocean. Thus, an Atlantic Niño (Niña) may contribute to a strengthening and prolongation of an Indian Ocean basin-wide cooling (warming).