Air-sea interaction in the South Atlantic Convergence Zone

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We studied the possibility of disentangling the air-sea interaction in the region of the South Atlantic Convergence Zone (SACZ) using Granger Causality as a measure of the directional coupling between the ocean and atmosphere. To do so we use daily data from the ERA Interim reanalysis from 1979 to 2013 (1.5°x1.5°) during the summer months of December-March, the season when the SACZ develops. We considered omega at 500mb to characterize convection and the sea surface temperature to characterize the evolution of the tropical and south Atlantic ocean. We focus the analysis on the leading mode of co-variability in the region which consists in a rainfall dipole accompanied by anomalous sea surface temperatures below. The methodology allows to distinguish four distinct regimes, depending on which of the two systems is the master one. Namely, it is possible to identify years in which the forcing is mainly directed from the atmosphere to the ocean and vice versa, years in which the influence is mutual, and years in which the influence is not significant in any of the two directions. A composite analysis of this four regimes is then carried out to understand the different dynamics taking place. We found that ocean-driven events are associated with an oceanic shift and intensification of the SACZ, while events in which the coupling is not clearly detected are mainly related to stronger precipitations over the continent. Finally, we highlight that this method seems promising for detecting interactions between ocean and atmosphere, and we plan to apply and test it in other areas in which complex feedbacks between these two systems are taking place.