Longitudinal variations of SST event characteristics in the tropical Atlantic and Pacific oceans

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Sea surface temperature (SST) variability in the tropical Atlantic and Pacific oceans is characterized by strong, interannual modes, whose warm and cold events are referred to as Atlantic and Pacific Ninos and Ninas, respectively. While the basins are comparable in terms of their principal physical set-up, the characteristics of their SST events differ substantially from each other. One well-researched aspect of the Pacific El Nino-Southern Oscillation (ENSO) is its asymmetry. Although the term refers to a number of known non-linearities within the ENSO phenomenon in general - such as differences in the spatial and temporal evolution between warm and cold events -, we focus here specifically on the length and strength of events. We use a simple event identification method that isolates events within a time series of anomalies, relative to a threshold that is based on its standard deviation. We then apply this method along the equator and quantify how length and strength asymmetries between warm and cold events vary in dependence of longitude, both in the tropical Atlantic and Pacific. We show that for the period 1958-2016, events tend to be of statistically indistinguishable length in the entire tropical Pacific, while warm events are significantly longer than cold events in the Atlantic cold tongue region. In agreement with previous research, we find that the strength of events is highly asymmetrical in the Pacific, with cold events being significantly stronger than warm events in the western basin and vice versa in the eastern basin, where mean magnitudes differ by roughly 1K. In contrast, event strengths are statistically equal in the entire tropical Atlantic. To understand these findings, we investigate both seasonal and zonal variations of the Bjerknes feedback, which lends growth to Nino and Nina-like SST anomalies.

Keywords: Atlantic Nino, El Nino-Southern Oscillation, Bjerknes feedback

