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On the relationship between the South Atlantic Anticyclone and Atlantic Niños

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Interannual sea surface temperature (SST) anomalies in the eastern equatorial Atlantic are associated with the Atlantic Niño mode. Warm (Niño) and cold (Niña) events have a large effect on the marine ecosystem and rainfall variability over adjacent land regions, and thus produce large socioeconomic impacts. These eastern equatorial Atlantic SST anomalies are connected to modulations in the strength of the South Atlantic subtropical high-pressure system, referred to as the South Atlantic Anticyclone (SAA). Using ocean and atmosphere reanalysis products we show that the strength of the SAA in boreal winter and spring impacts the timing of the cold tongue onset and the intensity of its development in the eastern equatorial Atlantic via anomalous equatorial wind power. This modulation of the timing and amplitude of the seasonal cold tongue development manifests as anomalous SST events peaking between June and August. There are, however, differences between warm and cold events with respect to the timing and impact of this connection. For cold events, an anomalously strong SAA in February and March leads to positive wind power anomalies from February to June resulting in an early cold tongue onset and subsequent cold SST anomalies in early boreal summer. For warm events, it is an anomalously weak SAA later in boreal spring generating negative wind power anomalies that leads to a late cold tongue onset as well as a suppression of the cold tongue development and associated warm SST anomalies.