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Decadal modulation of the relation between equatorial wind anomalies and Atlantic Niños – implications for predictability

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Both observations and general circulation models indicate that the annual development of the equatorial Atlantic cold tongue during boreal summer is sensitive to equatorial zonal wind anomalies in the preceding months, particularly boreal spring. Thus westerly anomalies during MAM are associated with a weakened cold tongue in JJA (Atlantic Niños) and easterly anomalies with a more pronounced cold tongue (Atlantic Niñas). ICOADS observations as well as NCEP and ERA40 reanalyses suggest that the strength of this surface wind-SST relation varies on decadal time scales, with the period 1980-2000 associated with particularly high correlations. A 21-year running correlation of western equatorial surface zonal winds in MAM and Atlantic cold tongue SSTs in JJA shows that correlations vary from approximately 0.3 to 0.55 in both observations and reanalysis. Periods of high correlation are associated with a weakened SST gradient along the equator, consistent with some previous modeling studies of equatorial Pacific variability. Analysis of an ocean reanalysis product further indicates a weakening of the equatorial surface current and a reduced thermocline slope during periods of high correlation. These decadal-scale modulations have significant implications for the evolution and predictability of Atlantic Niños. Links to off-equatorial ocean dynamics will also be discussed.