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On the configurations of the Atlantic Niño phenomenon under negative AMO phases

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An air-sea coupled mode of inter-annual variability akin to ENSO emerges in the tropical Atlantic basin, named as Atlantic Niño. The teleconnections of the Atlantic Niño phenomenon have changed during recent decades, coinciding with an alteration of its spatial configuration. Previous studies have suggested that the background state could favour particular atmospheric forcings and could also contribute to generate different variability modes. Here, we demonstrate that two different Atlantic Niño patterns coexist in the tropical Atlantic basin during certain decades, coinciding with a negative phase of the Atlantic Multidecadal Oscillation (AMO). The leading mode, Basin-Wide (BW) Atlantic Niño, is characterized by positive SST anomalies covering the entire tropical Atlantic and the second mode, Dipolar (D) Atlantic Niño, presents an equatorial warming flanked by negative SST anomalies in north and south Tropical Atlantic. These modes are driven by different wind patterns, controlled by the Subtropical High Pressure Systems. The BW-Atlantic Niño is preceded by a weakening of both Azores and Sta Helena High, which induces a general reduction of the tropical trades and anomalous wind convergence in the equatorial band. On the other hand, the D-Atlantic Niño is associated with a strengthening of Azores High and a weakening of Sta Helena High, given rise to a meridional Sea Level Pressure (SLP) gradient that intensifies the subtropical trades and generate anomalous trans-equatorial winds along the equatorial band. Both modes seem to be forced by an ENSO-like signal emanating from the Pacific, but with different atmospheric response over the Atlantic. It could be attributed to the changes in the mean state during negative AMO phases. For these decades, shallower thermocline conditions, together with an increase of the oceanic variability (SST and thermocline) in the tropical Atlantic could contribute to the generation of both Atlantic Niño modes. Furthermore, a positive NAO-like signal could also favour the propagation of the atmospheric ENSO signal over the Atlantic basin. Further research about the forcings and processes involved in the development of these modes is required to better understand their associated impacts and performing future predictions.