Geophysical Research Abstracts
Vol. 18, EGU2016-2483, 2016
EGU General Assembly 2016

What caused the 2009 cold event in the Atlantic cold tongue region?

Kristin Burmeister, Peter Brandt, and Joke F. Lübbecke
GEOMAR Helmholtz Centre for Ocean Research Kiel, Kiel, Germany

The tropical Atlantic (TA) exhibits sea surface temperature (SST) variability on seasonal to inter-annual time scales. This variability is associated with changes of atmospheric dynamics, linking it to severe flooding or droughts in South America and West Africa. This study investigates processes in the TA that might have caused the extreme cold event in the Atlantic cold tongue (ACT) region in 2009. During boreal spring, a strong negative Atlantic meridional mode event developed in the TA associated with northwesterly wind anomalies along the equator. Contrary to what would be expected from ENSO-like dynamics, these wind anomalies did not lead to a warming in the eastern equatorial Atlantic in boreal summer. Instead, from May to August 2009, an abrupt cooling took place in the ACT region resulting in the coldest August ACT SST on record. In the literature, two processes – equatorial wave reflection and meridional advection of subsurface temperatures – are discussed as potential causes of such an event. Whereas previous studies are mainly based on satellite data, reanalysis products and model output, we here use in situ measurements (data from Argo floats, PIRATA buoys, and TACE moorings, as well as CTD data of various ship cruises) in addition to satellite and reanalysis products to investigate the contribution of both processes to the strong surface cooling in the ACT region in 2009. Results based on the Argo float data confirm previous findings that equatorial wave reflection contributed to the cold event in the ACT region in 2009. They further indicate that higher baroclinic mode waves played an important role. The analysis of in situ and reanalysis temperature and velocity data does not suggest a significant contribution of meridional advection of subsurface temperatures for the onset of the 2009 cold event. The results indicate an asymmetry in the importance of meridional advection for non-ENSO-like cold and warm events with warm events more strongly affected or dominated by meridional advection.