Geophysical Research Abstracts
Vol. 21, EGU2019-7289, 2019
EGU General Assembly 2019

Causes and evolution of the southeastern tropical Atlantic warm event in early 2016

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In January and February 2016, a strong warm event was observed in the southeastern tropical Atlantic Ocean off Angola and Namibia with sea surface temperature anomalies reaching 3ºC. The analysis of various direct observations indicates that the warming was not predominantly forced by an equatorial Kelvin wave exciting a coastally trapped wave as for classical Benguela Niño events. Instead it resulted from a combination of local processes that are related to a weakening of the alongshore, i.e. mainly southerly, winds and enhanced freshwater input through local precipitation and river discharge. Consistent with the weakened winds, we find a reduction in latent heat loss from the ocean and a poleward surface current anomaly. The surface freshening, which is detected in satellite observations of sea surface salinity, caused a very shallow mixed layer and enhanced upper ocean stratification. This is supported by the analysis of the velocity structure of the Angola Current at 11ºS, which shows that at the time of the event subsurface velocities were directed northward while surface velocities were directed southward. The shallow layer of warm and fresh surface water was thus advected poleward by the surface current. A reduction of the local upwelling and the formation of a barrier layer that inhibits the entrainment of cool subsurface waters into the surface mixed layer might have contributed to the warm surface anomaly as well.