"Proposed Study of Circulation and Heat Storage Variability in the Atlantic ITCZ Triangle"
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The eastern tropical Atlantic Ocean plays a crucial role in climate variability over Africa and the Americas that is of importance to humans, including impacts on human diseases, droughts over Africa and northeastern Brasil, and the generation and intensification of tropical storms in the North Atlantic. The dominant atmospheric structure that influences this region is the Inter-Tropical Convergence Zone (ITCZ), which in turn is strongly influenced by the ocean below.

North of the equator in the eastern Atlantic the wind flowing off the African coast and the Ekman divergence produce both coastal and open-ocean upwelling in a triangular zone extending from the African coast to about 30^{o}W, and from somewhat north of the equator to 15^{o}-20^{o}N. In addition to increased biological productivity, this process leads to thin surface mixed layers, lifting of deeper, colder water, and consequent impacts on heat storage. Recent numerical models have shown that this "ITCZ triangle" is also in roughly the same area as the subtropical shadow zone, where subsurface flow from subduction sites farther north tends to circulate around a plateau in potential vorticity off northwest Africa. Water that takes this route as part of the lower limb of the so-called "Subtropical Cell" finally arrives to be upwelled in the tropics on decadal time scales.

Our proposed work focuses on heat storage and circulation in this region. The proposed work will include: 1) deployment of profiling floats to augment the regional ARGO coverage (poor in much of the area in question); 2) deployment of isobaric and isopycnal RAFOS floats at a number of shallow levels; 3) quantification of the annual cycle and anomalies of heat storage in the area from the augmented ARGO array; 4) description of the circulation into this "ITCZ triangle" as well as around it at deeper levels from a combination of tracked profiling floats, ARGO floats and RAFOS floats; 5) estimation of heat advection from combined thermal (profile) data along with geostrophically computed and directly measured velocities (by floats). The resources needed for the float observations (i.e. sound sources) are strongly leveraged by ongoing projects in the region by French and German investigators. These measurements will be important in developing numerical models of the area that can adequately represent the variability in heat storage produced by changes in surface layer thickness, advection, and the characteristics of the water upwelled from below, something that current coupled models do not do well and which may limit predictability of SST in the region.

Proposed RAFOS Deployments