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Tropical Instability Waves and the warming of the Atlantic cold tongue : Analysis of the ATLAS and ADCP PIRATA moorings data from 0n, 23W

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Temperature, salinity, and recent velocity records from the PIRATA moorings at 0oN, 23oW collected during 2002, as well as accompanying satellite SST and winds are used to examine the Tropical Instability Waves (TIW) and their role in the mixed layer heat balance of the central equatorial Atlantic. The TIW appear as periodic 20-30 day fluctuations in currents which intensify beginning in June in phase with the strengthening of the southeasterly trade winds and the seasonal appearance of the equatorial cold tongue. Zonal velocity fluctuations are largest in July-August, while meridional velocity fluctuations are largest in August-September. The meridional component of velocity is also distinguished from the zonal component in that fluctuations of the meridional component extend coherently in the vertical to at least 120 m while zonal fluctuations are coherent within the mixed layer only. Our estimate of horizontal eddy heat advection in the mixed layer averaged June-September is ~ 100 W m-2 with meridional advection dominating and peaking in late boreal summer. Averaged over the whole summer the contribution of the TIW events to the warming of the mixed layer is of 0.5oC, which corresponds to a modest value of the eddy heat advection of 15 W m-2. Since this value is very much less than the estimates of the summer mean eddy horizontal heat advection of 50 - 100 W m-2 this indicates that horizontal and vertical eddy heat advection balance in part.

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