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Deep diurnal cycle turbulence due to Tropical Instability Waves in the Atlantic at 10˚W

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Interannual variability of the position and strength of the Atlantic marine inter-tropical convergence zone is closely linked to anomalies of the sea surface temperature in the eastern equatorial upwelling regions. Here, we quantify the impact of diapycnal mixing processes on the variability of sea surface temperature from microstructure measurements collected in the equatorial cold tongue along 10˚W during two cruises in September 2005 and December 1994. The microstructure dataset reveal very different intensities of turbulent mixing and associated heat flux during the two cruise periods. In September 2005, the presence of deep-diurnal cycle turbulence resulted in elevated eddy diffusivities and strong diapycnal heat flux of 70 Wm^{-2} across the base of the mixed layer. The observed deep-cycle turbulence was not only associated with vertical shear from the Equatorial Undercurrent (EUC), but was also present in a region away from the EUC where vertical shear was solely caused by Tropical Instability Waves. In contrast, low mixing levels that resulted in negligible diapycnal heat flux were observed during December 1994. Our observations suggest high temporal variability of elevated mixing levels and that strong diapycnal heat flux associated with deep-cycle turbulence is found not only in the region of the EUC but over the whole region occupied by Tropical Instability Waves.