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Poster
The Prediction and Research Moored Array in the Tropical Atlantic (PIRATA) consists of eighteen moorings in the tropical Atlantic that have been used for climate research, numerical weather prediction, and ocean forecasting for over two decades. The Tropical Atlantic Current Observations Study (TACOS) resolved for the first time the upper ocean currents and shear at the 4N, 23W PIRATA mooring from March 2017 to November 2020. Analysis of nearly four years of TACOS data, collected during three successive deployments, has yielded several new insights: The mean zonal currents are eastward with maximum of ~12 cm/sec between 27 and 37 m. Maximum vertical shear squared is found near 30 m depth on average, just below the base of the mixed layer in winter and spring, and at 62 m associated with the summertime deepening of the mixed layer. Analysis of the second and third TACOS deployments confirms the significant interannual variability of zonal and meridional velocity in this region, with stronger eastward flow near the surface and stronger southward subsurface flow during those deployments compared to the first deployment. There is a weak semi-annual (annual) seasonal cycle in the near-surface (subsurface) currents. The mean and seasonally varying currents are significantly smaller than velocity fluctuations associated with westward propagating tropical instability waves (TIWs), near inertial waves, and semi-diurnal variations. Despite the Atlantic zonal mode being in a positive phase in 2017-2020, energetic summertime TIWs were observed in 2017 and 2019 with ~75 to 100 cm/sec amplitude meridional velocity fluctuations. These TIWs are important because they are associated with elevated vertical shear, and generate significant mixing and monthly mean turbulent cooling. Summertime TIW composites of temperature, salinity, velocity, shear squared, and stratification are compared for strong (2017, 2019) TIW vs. weak/moderate (2018, 2020) TIW years.
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