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Turbulent kinetic energy dissipation rate and attendant fluxes in the western tropical Atlantic estimated from ocean glider observations

Peter Sheehan, Gillian Damerell, Philip Leadbitter, Karen Heywood, and Rob Hall
University of East Anglia, School of Environmental Sciences, Centre for Oceanic and Atmospheric Sciences, Norwich, United Kingdom of Great Britain – England, Scotland, Wales (p.sheehan@uea.ac.uk)

Ocean gliders enable us to collect the ocean microstructure observations necessary to calculate the dissipation rate of turbulent kinetic energy, ε, on timescales of weeks to months: far longer than is normally possible using traditional ship-based platforms. Slocum gliders have previously been used to this end; here, we report the first detailed estimates of ε calculated using observations collected by a Seaglider. Seaglider 620 was deployed in the western tropical Atlantic in early 2020 and was equipped with a FP07 fast thermistor. We use these same fast thermistor observations to calculate ε following the Thorpe scale method. We find very good agreement between estimates of ε calculated following the two methods. The Thorpe scale method yields the larger values of ε, but the average difference, less than an order of magnitude, is smaller than reported elsewhere. The spatio-temporal distribution of ε is comparable for both methods. Maximum values of ε (10^{-7} W kg^{-1}) are observed in the surface mixed layer; relatively high values (10^{-9} W kg^{-1}) are also observed between approximately 200 and 500 m depth. These two layers are separated by a 100 m thick layer of low ε (10^{-10} W kg^{-1}), which is co-located with a high-salinity layer of Subtropical Underwater and a peak in the strength of stratification (i.e. in N^2). We calculate the turbulent heat and salt fluxes associated with the observed turbulence that act to ventilate deeper layer of the ocean. Between 200 and 500 m, ε induces downward (i.e. negative) fluxes of both properties that, if typical of the annual average, would have a very small influence on the heat and salt content of the salinity-maximum layer above. We compare these turbulent fluxes with estimates of fluxes due to double diffusion, having objectively identified those regions of the water column where double diffusion is likely to occur. While the downward heat flux due to double diffusive mixing is lower than that due to mechanical mixing, the downward salt flux due to double diffusive mixing is six times greater.