Geophysical Research Abstracts
Vol. 16, EGU2014-382, 2014
EGU General Assembly 2014

Comparison of Ellison and Thorpe scales from Eulerian ocean temperature observations.

Andrea Cimatoribus (1), Hans van Haren (1), and Louis Gostiaux (2)
(1) Royal NIOZ, FYS, 't Horntje (Texel), Netherlands, (2) Ecole Centrale, LMFA, Lyon, France

The geographical distribution of turbulent dissipation rate in the ocean is poorly understood at best. Turbulent dissipation rate is measured either by means of microstructure shear measurements, seldom performed in the open and deep ocean, or by means of adiabatically reordering vertical profiles of density. The latter technique leads to the estimation of the typical overturn size, the Thorpe scale, which can used to estimate average turbulent dissipation rate by using empirical relations linking the Thorpe scale to the Ozmidov scale of turbulence (Dillon, 1982). However, estimation of the Thorpe scale from temperature measurements can be difficult if a reliable determination of the vertical density profile is hindered by lack of resolution, salinity intrusions or low signal to noise ratio.

We present here a method to estimate the typical overturn size by measuring the Ellison length scale using frequency spectra of temperature. We apply the method to high resolution temperature data from three moorings deployed at different locations around the Josephine sea mount (North Eastern Atlantic Ocean). It is shown that the variance of the temperature time series at the higher end of the internal wave frequency band and above is well correlated with the overturn size. The method is based on a time frequency decomposition using the "maximum overlap discrete wavelet transform". This method can be a viable alternative for indirectly estimating turbulent dissipation rate in the ocean when limited vertical information is available but time resolution is sufficiently high.

A major result is the indication that fine structure contaminated temperature measurements can in fact provide reliable information on turbulence intensity. This method could thus contribute to extending our knowledge of the turbulent dissipation rate distribution, enabling the estimation of the latter from datasets where Thorpe scales cannot be reliably determined.