Turbulence estimation using fast response thermistors attached to CTD frames

*Yasutaka Goto[1], Ichiro Yasuda[1], Maki Nagasawa[1]

1. ATMOSPHERE AND OCEAN RESEARCH INSTITUTE

Turbulence observations have been limited because of difficulty in microstructure measurements. In order to efficiently obtain more turbulence data down to the ocean floor without spending extra ship-time, we introduce a new method using a fast response thermistor attached to a CTD frame. Turbulence intensity from CTD-attached profilers is evaluated by comparing it with free-fall vertical microstructure profilers measured at the same location within 2 hours. Turbulence intensity from the CTD-attached profilers is roughly comparable with the one from the free-fall profilers. Whereas, excessively overestimated data are sometimes observed for the CTD-attached method, and regarded to be abnormal since those data are deviated from log-normal distributions and correspond to the small fall rate W ($W < 0.5$ m/s) and the large standard deviation of W ($W_{sd} > 0.1$ m/s). Temperature gradient spectra also tend to be disturbed in that case. The overestimated data are capable to be removed by the simple criterion of $W_{sd}/W > 0.2$. As a result of the data screening, thermal and energy dissipation, χ and ε, from CTD-attached and free-fall profilers are consistent within the factor of 3 in the range of $10^{-10} < \chi$ [℃^{2}/s] (ε [W/kg]) $< 10^{-7}$ (10^{-8}) for 50m-bin averaged data, respectively. Observations using CTD-attached profilers are performed covering a wide range of the northwest Pacific Ocean, and turbulence distribution from the surface to the deep ocean is estimated.

Keywords: physical oeanography, turbulence, micro temperature, oceanic observations, microstructure profiler

