Upper Ocean Processes at the Folger Pass node

(a 10-minute presentation)

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Due to the ocean's relative opacity to electromagnetic radiation, most non-intrusive investigations of the ocean's behavior and contents make use of underwater acoustics, and a great deal of research has been done both to understand the characteristics of underwater sound propagation and to exploit these characteristics to quantify a large variety of small-scale features of the ocean. These include characterization of physical features such as bubbles, turbulence, and sharp changes in stratification, as well as identification and enumeration of fish and zooplankton by measuring the acoustic energy reflected from them.

Larger objects, or dense agglomerations of smaller objects generally provide stronger reflections (although there are many subtleties which must be accounted for). In recent years successes in discriminating between different features have been achieved using simultaneous (or near-simultaneous) measurements of scatter at multiple frequencies. This is because many of these features have target strengths that vary with frequency (i.e. they have an `acoustic colour'), and multi-frequency measurements allow us to discrimate on the basis of this `colour'. Moored multi-frequency instrumentation therefore has the potential to monitor many important small-scale features of the ocean.

Here we discuss a 3 year record of multi-frequency near-surface backscatter, obtained at 1 sec intervals, from the Folger Pass NPETUNE node. The original motivation for this analysis was to investigate a method of in-situ intercalibration of the different frequencies, which was found to be required as a precursor to understanding the observed target strengths of fish and zooplankton within the water column. However, the analysis also provides a wealth of detail about oceanographic features of the water column and their effect on acoustic propagation over both the short and long term. In particular, long-term statistics are derived about the penetration depth and size spectrum of bubbles below the surface, and a high-resolution time series of mean water column temperature.