Geophysical Research Abstracts
Vol. 20, EGU2018-18415, 2018
EGU General Assembly 2018

Mapping turbulent diffusivity using Seismic Oceanography

Will Fortin (1), W. Steven Holbrook (2), and Raymond Schmitt (3)

(1) Lamont-Doherty Earth Observatory of Columbia University, Palisades, United States (wfortin@ldeo.columbia.edu), (2) Virginia Tech, Blacksburg, United States (wstevenh@vt.edu), (3) Woods Hole Oceanographic Institution, Woods Hole, United States (rschmitt@whoi.edu)

Regional meso- and sub-mesoscale features play a primary role in maintaining the meridional overturning circulation. However, comprehensive data sets using direct measurement are difficult to compile for a given feature with standard oceanographic sampling methods due to their mobile nature and limited spatial extent. Here, we present a method to map and estimate turbulent diffusivity via seismic slope spectra that extracts diffusivities directly from seismic images, using tracked reflections to scale diffusivity values. The result provides estimates of turbulent diffusivities throughout the water column at scales of a few hundred meters laterally and 10 m vertically. Synthetic tests demonstrate the method's ability to resolve turbulent structures and reproduce accurate diffusivities.

In this presentation, we focus on sites in the South China Sea where some of the largest amplitude internal waves are formed in the global ocean. These internal waves propagate into the South China Sea (SCS) and develop into soliton-like internal wave pulses that have been observed by moored instruments and satellite backscatter data. We find evidence to support that these waves are generated as the result of tidal interaction with the Heng-Chun and Lan-Yu ridges. Further we show that soliton and non-soliton internal waves have very similar turbulent "fingerprints" in the water column. These features add significant energy to global ocean overturning as we find local diffusivity values range over an order of magnitude and elevated mixing can be more than two orders of magnitude larger than typical open-ocean values.