Geophysical Research Abstracts
Vol. 14, EGU2012-7808, 2012
EGU General Assembly 2012

Investigating turbulent mixing rates and the internal wave field in the Southern Ocean: microstructure and finestructure data from DIMES

K. Sheen, A.C. Naveira-Garabato, and J. A. Brearley
United Kingdom (k.sheen@soton.ac.uk)

The principal objective of the Diapycnal and Isopycnal Mixing Experiment in the Southern Ocean (DIMES) is to investigate the role of turbulent mixing in mediating the vertical and horizontal transport of water masses, which shape the overturning circulation. Here, microstructure and finestructure data, collected as part of this multi-component experiment, are presented.

Direct observations of turbulent energy dissipation rates show that mid-depth diapycnal diffusivities increase progressively from $O(10^{-5}\ \mathrm{m^2s^{-1}})$ in the Pacific sector of the Antarctic Circumpolar Current (ACC) to $O(10^{-4}\ \mathrm{m^2s^{-1}})$ in the Scotia Sea. Analysis of coincident LADCP and CTD data demonstrates that enhanced turbulent dissipation rates are associated with a more energetic, less inertial internal wave field and increased upward energy propagation. Breaking lee waves, a process enhanced by stronger flow and rougher topography found in the eastern sections, is likely to be a key mechanism in determining the distribution of turbulent mixing in the ACC. Spatially varying discrepancies between the microstructure and finestructure mixing observations indicate regions where wave-wave interaction models break down and internal waves interact with the mean flow.

An episodic enhancement of current velocities at 2000 m depth is observed in the northwest Scotia Sea in both LADCP and mooring data. Finestructure analysis indicates that this mid-depth jet has a profound impact of the internal wave field, causing both internal wave reflection and critical layer dissipation.