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Spatial variation of diapycnal mixing from hydrographic surveys in the subpolar North Atlantic

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Mixing induced transformation of water masses maintains the ocean stratification and supports the Meridiornal Overturning Circulation. During the year 2003-2010, eight large-scale hydrographic survey cruises were carried out with combined CTD/LADCP measurements in the subpolar North Atlantic. Observational data are analyzed to get an overview of the extent of diapycnal mixing in this area.

It is found the magnitude of diffusivity K_ρ in mid-depth ocean is $O(10^{-4}\mathrm{m}^2\mathrm{s}^{-1})$, but mixing is obviously intensified over rough topography (Mid Atlantic Ridge), in the region of Western Boundary Current (WBC), and to the north of Greenland. In some regions, K_ρ can exceed $O(10^{-3}\mathrm{m}^2\mathrm{s}^{-1})$. Diapycnal diffusivity is significantly dependent on the bottom roughness and bathymetry. A linear fit is made between logarithms of bottom diffusivity and variance of topography. In general, the diapycnal diffusivity and the shear/strain variance ratio both increase with depth. The mean value of shear/strain variance ratio in this area is 5.3, indicating that internal wave field may not have so much energy as expected by Kunze et al. (2006).