Estimating Basin-Averaged Diapycnal Diffusivities

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In order for global ocean circulation to occur, the production of bottom water at the poles must be balanced by buoyancy flux away from the surface of the ocean. A large part of this flux is produced by turbulent processes in the deep ocean, particularly near the rough topography of mid-ocean ridges. One way of quantifying turbulent mixing is with diapycnal diffusivity, the rate of mixing across surfaces of constant density in the ocean. Regionally averaged diffusivity profiles over the East Pacific Rise show enhanced mixing above the ocean floor, with diffusivity values reaching in excess of 10^{-3} m^2/s. Profiles derived using both a constant assumed background energy dissipation and dissipation values from microstructure measurements agree closely everywhere in the water column except in the top few hundred meters near the surface, implying that diffusivity profiles calculated from buoyancy frequency data alone are accurate portrayals of mixing at depth. Two different basin-averaged diffusivity profiles for the Pacific provide upper and lower bounds for diffusivity in the deep ocean on a larger scale. The difference between the two profiles is quite large at some depths, necessitating refinement of the method before greater constraints can be placed on large-scale averages of diffusivity. It is likely that true diffusivity values in the ocean are closer to the lower limit set by the derived profiles.