

**TURBULENT MIXING IN THE OCEAN AND SHELF SEAS SURROUNDING ANTARCTICA**

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We review observations of ocean turbulence and mixing acquired during process studies in Antarctic seas, describe the implications of these observations to the parameterization of mixing in general circulation models (GCMs), and identify regions and ocean processes deserving of further study. Since 1992, turbulence data have been collected as components of ocean process studies in the western Weddell Sea, near Maud Rise in the eastern Weddell Sea, near Marguerite Bay (Bellingshausen Sea), in the northwest Ross Sea, and over the shelf break and inner shelf near the Mertz Glacier tongue. Estimates of mixing based on CTD data and vessel-mounted ADCP data provide further information for the region surrounding the South Scotia Ridge. These measurements cover a wide range of mixing conditions, from very weak turbulence offshore Marguerite Bay, to very intense mixing in the outflow of High Salinity Shelf Water (HSSW) across the Ross Sea shelf break. In the pycnocline, the most energetic mixing is associated with shear instabilities, which are augmented under appropriate hydrographic conditions by nonlinear equation-of-state effects (cabbeling and thermobaricity). Double diffusive convection also plays a role in mixing in many locations. In the surface mixed layer, intense mixing has been observed, associated with rapid ice drift under strong polar low pressure systems and in a katabatic wind event near the Mertz Glacier. Analyses of these data sets suggest that mean mixing rates are dominated by sites of locally very energetic turbulence embedded in more extensive regions of relatively weak mixing. Further modulation of turbulence, including that predicted to lead to basal melting under the ice shelves, is provided by tides. We discuss strategies for incorporating the spatial and temporal variability of Antarctic ocean mixing into regional and global GCMs. We also identify regions and processes for which we presently have little information on which to base mixing parameterizations, and suggest field and analysis activities to overcome these limitations in the representation of the Southern Ocean in global models.