



Variability of turbulent mixing in the eastern south Indian Ocean

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Turbulent mixing plays an important role in large-scale oceanic processes such as watermass transformation, global overturning circulation and stratification. The sensitivity of ocean models to the spatial and temporal variability of mixing has implications on ocean heat uptake in climate models and ocean circulation in regional models. Partly because of the lack of observations, the turbulent mixing in the southeast Indian Ocean is not well described. This study investigates the spatial and temporal variability of turbulent mixing in the eastern South Indian Ocean (SIO) using Electromagnetic Autonomous Profiling Explorer (EM-APEX) floats, vertical microstructure profilers, and shipboard CTD data during 2013. The EM-APEX floats sampled the upper ocean with a frequency of 8 profiles per day which is high enough to resolve the internal waves who change the local mixing when they break in the ocean interior. The floats measured current velocities and water mass properties up to a depth of 1200 m with a resolution of 3 - 4 m in the vertical. By applying a shear-strain parameterization on the float data, we estimated the diapycnal diffusivity in the upper 1200 m of the ocean. We observe elevated diffusivity associated with wind near the surface, bathymetry and mesoscale eddies. Both warm core and cold core eddies impact the distribution of turbulent mixing. High mixing observed in the warm core eddy suggests trapping of near-inertial waves. We also observe elevated mixing below cold core eddy associated with deep reaching near-inertial waves. By applying a strain-only parameterization on the shipboard data, we observe elevated diffusivity near bathymetry associated with bottom-generated internal waves. Elevated mixing is observed at depths corresponding to Antarctic Intermediate Water and Subantarctic Mode Water suggesting that turbulent mixing impacts the modification of watermasses in this region. This work improves our understanding of turbulent mixing variability in the eastern SIO, a climatically important region for Australia.