Ocean turbulence and mixing around Sri Lanka

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Turbulence and mixing is important phenomena in ocean which stirs and mixes sea bottom and makes surface water highly productive. It is important to know what processes are involved in making ocean waters productive and this is the first such effort has been taken to identify the plausible processes around Sri Lanka. Detailed measurements campaign was conducted using vertical micro-structure profiler, conductivity temperature depth profiler and Acoustic Doppler current profiler (ADCP) for turbulence and mixing studies during 2013 and 2014. Results reveal that very strong stratification in the sharp Bay of Bengalpycnocline can damp wind-induced mixing, preventing the penetration of turbulence below a thin surface layer (15-20 m). Surface low-salinity layer was effectively decoupled from the thermohalocline during the moderate wind (11-12 ms^{-1}). However, horizontal/temporal gradients of temperature and salinity still exist above the mixed layer depth (MLD < 15-20 cm). The mixed layer deepened only slightly in higher winds (16-18 ms^{-1}) but being decoupled from the pycnocline. Substantial convective cooling and/or strong wind mixing in the upper layer during the Northeast monsoon was detected in south of Sri Lanka. The forcing gradually relaxed towards the transition period. The spatial structure of the dissipation rate is quite different along meridional and zonal transects to the south (WS) and to the east (TS) from Sri Lanka which crossed the summer monsoon currents (SMC) and East Indian coastal currents. The main features of turbulence in SMC were mostly confined to the surface mixed layer, which is detached from water interior by a strong pycnocline. Turbulence patches in the northern part of WS are appears to be generated by the influence of shelf break and then advected to the water interior. Contrary to SMC turbulence, the high-level dissipation along TS was mostly confined in a very narrow and sharp slopping upper pycnocline. The most probable source of such turbulence could be the strong shear instability at narrow interfaces, which was recorded in ADCP data in the lower secondary pycnocline (70-80 m).

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