Turbulence and mixed layer depth characteristics in the interior of Sri Lanka Dome

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Sri Lanka Dome (SLD) is a cyclonic feature form in the East of Sri Lanka due to Ekmann pumping, generated South West monsoon wind. The phenomenon is formed in July and disappears at the end of September each year. Though, limited investigations have been carried out on SLD, this is the first field effort on the study of small scale dynamics in the Dome. Vertical micro-structure profiler was used to investigate small scale dynamics and surveys were conducted on July 15th to 16th (night) and 16th to 17th (night) at 20 stations along a so called cyclonic eddy. The total length of survey line was about 90 nautical miles. The results indicated that the temperature at the west of SLD is 29.1^{o}C , which decreased towards the center and was 28.4 ^{o}C at the east end of the SLD. Salinity was around 34.05 psu at the West end (-45 m) and however, the salinity decreased towards the center of the dome reaching 33.95 psu. The development of upward doming structure of the pycnocline toward the SLD center could be observed, leading to substantial shallowing of the Mixed Layer (MLD). MLD estimation was done based on the density profiles obtained through seabird sensors attached to the micro-structure profiler. MLD is about 40 m at the west end of the dome (-45 m) and decreases towards the middle reaching approximately 20 m. However, MLD is lowest (10 m) at the east side of the dome. Strong density stratification could be observed in the potential density variation along the survey line. The halocline and pycnocline appears to be sloping towards the western part of the dome. Cyclonic circulation during South West monsoon associated with SLD generating an upwelling area of halocline at the SLD center with an average slope of about 30 m over 100 km. Doming of the sharp density interface between surface mixed layer and stratified water interior led to substantial shallowing of the mixed layer depth from around 40 m outside the SLD to ~10-15 m closer to its center. The TKE dissipation rate was found to be substantially higher at VMP stations presumably occupying the inner periphery of SLD, that is about 10-25 nautical miles away to the west from the expected SLD core.

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