Interannual Variability of Mixed Layer Depth in Tropical Indian Ocean

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Mixed layer depth (MLD) is an important parameter for understanding the sea surface temperature variations. With the numerous recent works suggesting clear climatic impacts of the Indian Ocean sea surface temperature, it hence seems necessary to describe MLD variability in the Indian Ocean in detail. While previous works have already documented the MLD seasonal cycle in the Indian Ocean, description of basin scale interannual variability of the MLD in this ocean still lacks, in particular because of sparse temperature and salinity profiles coverage.

Interannual variability of MLD in the Tropical Indian Ocean is investigated using Argo data (with a good coverage from 2002 to 2009) and Hydrographic data from 1980-2002. The MLDs are estimated directly from individual profiles, as in de Boyer Montegut et al (2004). Maximum interannual variability is found along the Somali upwelling region, central Arabian Sea, eastern equatorial Indian Ocean and south tropical Indian Ocean. Ratio of interannual variability to seasonal variability is highest along the equatorial Indian Ocean. In northern Arabian Sea interannual variability is found to be very less compared to the seasonal variability. MLD variability in the Arabian Sea is dominated by the seasonal cycle, as expected from the very strong annual forcing in this region. The signature of the main modes of interannual variability in the Indian Ocean can be seen in the MLD interannual variability: remote impact of El Niño/La Niña (ENSO), the Indian Ocean Dipole (IOD), and the monsoons. Regression of MLD interannual variability to ENSO, IOD index and monsoon indices allows to better isolate the MLD signals associated with each of these phenomena.

References

[1] de Boyer Montégut, C., G. Madec, A. S. Fischer, A. Lazar, and D. Iudicone, 2004. Mixed layer depth over the global ocean: an examination of profile data and a profile-based climatology, J. Geophys. Res., 109, C12003, doi: 10.1029/2004JC002378 et al., 2004