



Control of salinity on the mixed layer depth in the world ocean

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A global gridded climatology of the differences between upper-ocean temperature and density stratifications designed to illustrate the control of the upper ocean mixed layer depth by salinity is presented and described. It is based on the individual analysis of instantaneous profiles, in contrast with previous large-scale climatologies derived from gridded fields. This ensures a more accurate description of the phenomenon and the barrier layers (BL) in particular. Local studies in well sampled areas as the tropical Pacific and the Indian Ocean enable us to validate our data set, and we discuss new features of the seasonal cycle of the BL. Typical amplitude, duration and vertical temperature inversions are described. We also propose new formation mechanisms when possible and needed, as in the subtropical Atlantic and subpolar basins. We can distinguish three types of regions: BLs are semi-permanent in the equatorial and western tropical Atlantic and Pacific, the Bay of Bengal, the eastern equatorial Indian Ocean, the Labrador Sea and parts of the Arctic and Southern Ocean. In the northern subpolar basins, the southern Indian Ocean and the Arabian Sea, BLs are rather seasonal. Finally, BLs are typically never detected around 40° latitude in each basin. Away from the deep Tropics, the analysis reveals strong similarities between the two hemispheres and the oceanic basins in terms of BL seasonality and formation mechanism. We suggest that this global product could be used as a reference for future studies and to validate the representation of upper oceanic layers by general circulation models.