Drifter-derived estimates of lateral eddy diffusivity in the World Ocean with emphases on the Indian Ocean and problems of parameterization

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The Global Drifter Program data set collected in the period of 1977-2010 is applied to develop $2°\times2°$ bin estimates of lateral eddy diffusivity K in the mixed layer of the World Ocean by means of a modification of the Davis (1987,1991) approach. The analysis is geographically focused on the Indian Ocean, the region where such calculations have been lacking. Since the Indian Ocean circulation is strongly determined by monsoonal winds, an effort was made to calculate K relative to monsoon-driven mean currents. In highly energetic near surface currents of the World Ocean at mid and high latitudes, the estimates of K are shown to follow the frozen field regime parameterization $K \sim \sqrt{EKE} \cdot L_{bc}$, where EKE is the eddy kinetic energy, and L_{bc} is the baroclinic Rossby deformation radius. On the contrary, in the tropical and equatorial zones the fixed float regime parameterization, $K = EKE \cdot T_0$, where $T_0 = const$ is the typical value of the Lagrangian integral timescale, is preferable.