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Mixing in surface 300 m layer of the Arabian Sea and the Bay of Bengal using ^{228}Ra and ^{226}Ra

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Radioisotopes ^{228}Ra (half-life = 5.75 y) and ^{226}Ra (=1622 y) along with temperature and salinity have been measured in 35 vertical profiles (surface to 300 m), 20 from the Arabian sea and 15 from the Bay of Bengal, in seven cruises aboard FORV Sagar Sampada. Ra isotopes are measured by preconcentration on Mn-coated fibres followed by gamma spectrometry. In most profiles, ^{228}Ra showed significant reduction between surface and 300 m due to decay. One-dimensional diffusion model yielded vertical eddy diffusivities (k_z) in the range of 0.12 to 10.3 cm^2 s^{-1} and 0.01 to 2.2 cm^2 s^{-1} using ^{228}Ra for the Arabian sea and the Bay of Bengal respectively. The vertical eddy diffusivity for the Arabian Sea is higher than those from the Bay of Bengal. A simple trivariate function $C_{(x,y,z)} = C_0 e^{-Ax}.e^{-By}.e^{-Dz}$, where C_0, A, B and D are constants, is fitted to the whole ^{228}Ra data. Substituting $C_{(x,y,z)}$ in the standard three-dimensional steady-state diffusion equation, the estimated values of A, B and D can be related to eddy diffusivities in the zonal, meridional and vertical directions respectively. Values obtained from the ^{228}Ra profiles for the eddy diffusivities, K_x, K_y and K_z are 8.7 x 10^7, 5.6 x 10^8 and 1.3 cm^2 s^{-1} respectively in the Arabian Sea and 2.0 x 10^8, 4.2 x 10^7 and 0.33 cm^2 s^{-1} in the Bay of Bengal. The K_x and K_y values in the Arabian Sea and the Bay of Bengal using ^{228}Ra are comparable to those derived from the tropical Pacific Ocean using the Lagrangian surface drifting buoy data obtained from EPOCS and TOGA studies. It is significant to note that the synoptic measurement values are matching well with those obtained from time averaged radiotracer methods. The vertical eddy diffusivities (k_z) in the Arabian Sea are higher than that of the Bay of Bengal due to intense upwelling in the Arabian Sea. The same is observed even with the 1-D model-derived K_z values. In the case of the Bay of Bengal, due to the fresh water lens on the top, upwelling is subdued. A detailed account of the geochemistry of Ra isotopes and the model will be presented.