^{234}Th and ^{210}Po-^{210}Pb based Carbon export flux along the Indian GEOTRACES GI02 section in the Arabian Sea and the Indian Ocean

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^{234}Th ($t_{1/2}$ = 24.1 d), present in seawater, is a naturally occurring particle reactive radionuclide formed through the radioactive decay of its parent, ^{238}U ($t_{1/2}$ = 4.47 x 10^9 y). The disequilibrium between ^{234}Th and ^{238}U is exploited to quantify fluxes of elements moving out of the euphotic zone by attaching on to sinking particles. As a part of the Indian GEOTRACES programme, high-resolution sampling was carried out at 11 stations in the Arabian Sea and the Indian Ocean during April – May 2014 from 17°N to 16°S along 65°E transect to estimate the particulate organic carbon export flux from the upper ocean. Average ^{234}Th fluxes integrated up to 100 m were 2612 and 1968 dpm m^{-2} d^{-1} for the Arabian Sea and the Indian Ocean, respectively. These values are ~ 5 times higher than those observed on a similar transect along 87°E in the Bay of Bengal (594 dpm m^{-2} d^{-1}) and the Indian Ocean (539 dpm m^{-2} d^{-1}). For the same season, the Arabian Sea and the Bay of Bengal showed highly contrasting carbon export trends (mean: 4.0 and 0.8 mmol C m^{-2} d^{-1}, respectively). Similar ^{234}Th based carbon export fluxes were reported during March - April 1995 in the Arabian Sea [1].

As a dual tracer approach, carbon export was concurrently determined by using ^{210}Po/^{210}Pb disequilibrium along the above transect. ^{226}Ra ($t_{1/2}$ = 1600 y) in seawater decays to ^{210}Pb ($t_{1/2}$ = 22.3 y) which further decays to ^{210}Po ($t_{1/2}$ = 138 d). The ^{210}Pb adheres to particle surface while ^{210}Po is removed both by surface adsorption and biological uptake. ^{210}Po export fluxes integrated up to 100 m varied from 3.5 to 38.4 dpm m^{-2} d^{-1} with high export flux near the north and south of equator. The ^{210}Po deficit flux and the POC/^{210}Po ratio in sinking particulate matter are used to calculate the carbon export flux. High ^{210}Po based carbon export fluxes were found near equator, 14.0 mmol C m^{-2} d^{-1} and 11.3 mmol C m^{-2} d^{-1} at 5.5°S and 4°N, respectively. These trends are unique from that observed by ^{234}Th technique indicating that there exists a strong seasonal variation in phytoplankton production and carbon export in the equatorial Indian Ocean.

[1] Buesseler et al. (1998) *Deep-Sea Research Part II* 45: 2461-2487.