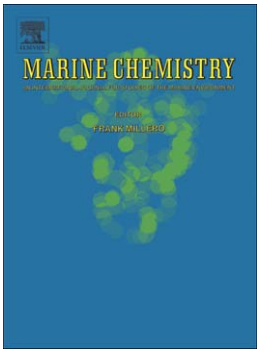

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Export Fluxes in Northern Gulf of Mexico – Comparative Evaluation of Direct, Indirect and Satellite-based Estimates

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ABSTRACT

The northern Gulf of Mexico (NGOM) is one of the well-studied areas of global ocean, yet direct estimates of upper ocean particulate organic carbon (POC) fluxes from this region are limited. The present work reports vertical fluxes of POC from the oligotrophic region of NGOM utilizing short-lived radionuclide pairs ^{234}Th/^{238}U and ^{210}Po/^{210}Pb. In spite of the difference in time scale both ^{210}Po and ^{234}Th based estimates are in reasonable agreement with sinking POC fluxes, caught in sediment traps. POC flux estimates ranged between 22-41 mg C m^{-2} day^{-1} at 150 m and 6-40 mg C m^{-2} day^{-1} at 250 m. The average export efficiency at base of euphotic zone (E_z) was found to be 0.07±0.03 while the export ratio (T_{100}) at 100m below euphotic zone was found to be 0.66±0.18 indicating that most of the attenuation of NPP in this region is set in the surface layer (low E_z ratio) and there is relatively little flux attenuation in the subsurface (high T_{100}) which is typical for oligotrophic settings. Satellite based export efficiencies predicted by the Laws and Dunne models are on average found to be two times higher than the *in situ* observations while estimates from the Henson model were found to be similar or lower. This is consistent with the observation on a global scale where we find export estimates from *in situ* data to be consistently lower than those predicted by the Laws export model for the temperature range of 20 – 25 ºC. The discrepancy between modelled estimates and *in situ* measurements of POC fluxes highlights the fact that global empirical models of satellite based POC fluxes that only consider temperature are overly simple and may need further refinement for ocean biome specific scaling to accurately predict export fluxes.