^{210}Po and ^{210}Pb as tracers of the biological pump in the ocean: Review of lab and field data

GILLIAN M. STEWART[1]

[1]Queens College, City University of New York, Flushing NY USA 11367 gstewart@qc.cuny.edu

Since Flynn (1968) developed his method to detect low levels of the naturally occuring radionuclide ^{210}Po in environmental samples, over 2000 peer-reviewed articles have addressed the distribution of ^{210}Po ($t_{1/2}$ = 138 d) and its grandparent ^{210}Pb ($t_{1/2}$ = 22 y) in the marine environment. About half of these papers focus on the bioaccumulation of ^{210}Po in marine organisms; the other half examines the disequilibrium between the isotopes in the water column. Since the 1970s, the radionuclide pair ^{210}Po/^{210}Pb has been used to trace particle export from the surface ocean, converting ^{210}Po deficits (deviations from secular equilibrium) in the surface ocean into the sinking flux of carbon via a C/^{210}Po ratio on sinking particles, analagous to the application of ^{234}Th/^{238}U to estimate particle flux. In the 21st century, our analytical and modeling methods have improved as has our understanding of particle scavenging, sinking, and remineralization. The importance of colloids, ballast, particle composition, and plankton community structure as well as the large variations in the ratio of C/^{210}Po (or C/^{234}Th) have spawned both more and more finely detailed, very-controlled laboratory experiments to examine scavenging as well as larger and more complete chemical and physical surveys of the distribution of these isotopes in the ocean. Here I will review some of the most important recent discoveries, as well as the major remaining unanswered questions in our understanding of the marine ^{210}Po and ^{210}Pb system, and its ability to trace the biological pump.