
Particle-scavenged \(^{234}\text{Th}\) and \(^{210}\text{Pb}\) can be used to trace the fate of particulate matter reaching the deep-sea floor. We used this technique to demonstrate rapid ingestion of particles arriving at the sea floor (at a depth of 4,100 m) by mobile epibenthic holothuroids (*Abyssocucumis abyssorum* and *Oneirophanta mutabilis*). Excess \(^{234}\text{Th}\) and \(^{210}\text{Pb}\) activities of sediment trap material, detrital aggregates from the sea floor, and animal gut contents all were similar while activities of surface sediments (top 0-5 mm) were considerably lower. A simple calculation using the excess \(^{210}\text{Pb}\) concentration of two potential food sources, sediment trap material and surface sediments, shows that \(~91\%\) of gut content material of *A. abyssorum* must have come from material similar to that found in the sediment trap cups. By setting the sediment trap material as age 0, apparent ages of \(<0-20\text{ d}\), \(>100\text{ d}\), and \(12-13\text{ d}\) were estimated for the aggregates, surface sediments, and *A. abyssorum* guts, respectively. The population of *A. abyssorum* at this site could potentially process 0.2-4\% of the vertical mass flux \((m^{-2}\text{ d}^{-1})\) during the high particle flux period between June and October 1994. The percentage of vertical flux processed could be substantially greater when all of the mobile epibenthic megafauna species are considered.