Abstract

^{234}Th is considered a valuable and useful tracer of oceanic biogeochemical processes occurring over timescales of days to weeks. While the geochemical behaviour of this radionuclide in the marine environment is well known, relatively few studies have explored its interactions with biota. To better understand biologically related ^{234}Th dynamics, bioaccumulation of ^{234}Th from the dissolved phase and its subsequent retention in small Antarctic crustaceans (the isopod *Natatolana oculata* and the amphipods *Orchomenella ultima* and *Uristes stebbingi*) was determined under controlled laboratory conditions. Despite morphological and behavioural differences, all three species displayed comparable concentration factors (CF $\geq$ 80) and very long retention of ^{234}Th (biological half-life not significantly different from infinity). From 16% (isopod) to 49% (both amphipods) of accumulated ^{234}Th was associated with the animal soft parts, which is substantial when compared with reported values for other particle-reactive transuranic elements. The relevance of zooplankton as a potential modulator of ^{234}Th distribution in the water column is discussed in light of these findings. CF-based computations suggest that, for typical zooplankton biomass, biologically-mediated interactions with particle flux models can be neglected. In contrast, in waters with very high crustacean biomass, such as krill schools, ^{234}Th distribution in the water column would be largely determined by these organisms. In such waters the biological compartment should be addressed as it could confound the reliability of vertical particle flux assessment using ^{234}Th as a proxy.

Keywords: Zooplankton, Amphipods, Isopods, ^{234}Th, Particle Fluxes, Southern Ocean