Seawater Th isotopes in the U. S. North Atlantic GEOTRACES transect: Sources, sinks and cycling

KUO.-FANG. HUANG[1,2], L. F. ROBINSON[1,3], M. E. AURO[1], R. F. ANDERSON[4], C. T. HAYES[4], M. Q. FLEISHER[4], R. L. EDWARDS[5], H. CHENG[5], Y. LU[5] AND S. B. MORAN[6]

[1]Woods Hole Oceanographic Institution, Woods Hole, MA, USA
[2]Institute of Earth Sciences, Academia Sinica, Taipei, Taiwan
[3]University of Bristol, Bristol, United Kingdom
[4]LDEO, Columbia University, Palisades, NY, USA
[5]University of Minnesota, Minneapolis, MN, USA
[6]University of Rhode Island, Narragansett, RI, USA
kfhuang@earth.sininca.edu.tw (Presenting author)

The distributions of the long-lived thorium (Th) isotopes, ^{232}Th ($t_{1/2}$ = 1.4×10^{10} years) and ^{230}Th ($t_{1/2}$ = 75,690 years), in the ocean have recently received more attention because of their potential for estimating detrital fluxes, including dust-derived fluxes to the ocean both today and in the past. The main controls on the depth profiles of these two isotopes in the modern ocean continue to be debated due to limited modern seawater data. To further improve our understanding of sources, sinks and cycling of seawater Th isotopes, measurements of dissolved and particulate ^{232}Th and ^{230}Th were made across the subtropical North Atlantic along the U.S. GEOTRACES section occupied in 2010 and 2011. The section included a region of high Saharan aerosol flux, from Portugal to Mauritania, and from there via Bermuda to Woods Hole along Line W.

In this study, high concentrations of dissolved ^{232}Th were observed in shallow water of the stations closest to Sahara dust plume as expected for a dust supply of lithogenic material to the ocean, and near the coast of the western Atlantic basin, most likely due to lateral advections from continental shelves. In the East-West depth transect, significant removal of ^{232}Th and ^{230}Th was detected near the hydrothermal plumes, nepheloid layers, and continental margins, indicating strong scavenging of these two isotopes by particles. Short residence time of Th and high ^{232}Th fluxes in the surface ocean were obtained at the sites close to the dust plume area and near the coast, suggesting significant influences of lithogenic input sources on seawater Th isotopes in the subtropical North Atlantic. A comparison of dissolved and particulate Th isotopes will be discussed in order to further constrain the main controls on the observed distributions of seawater Th isotopes.