Goldschmidt 2021 Abstract
https://doi.org/10.7185/gold2021.6866

^{227}Ac and ^{231}Pa in the southeast sector of Southern Ocean (Bonus GoodHope – GEOTRACES cruise

MARTIN LEVIER[1], MATTHIEU ROY-BARMAN[2] AND ARNAUD DAPOIGNY[3]

[1]LSCE
[2]LCSE/UVSQ/IPSL
[3]LSCE/IPSL, CEA-CNRS-UVSQ

Presenting Author: martin.levier@lsce.ipsl.fr

^{227}Ac (half-life = 27y) is a radioelement produced by the decay of ^{231}Pa. As ^{231}Pa is enriched in deep marine sediments, soluble ^{227}Ac diffusing from the sediment in the bottom water is a good tracer of the vertical mixing of deep water on the decadal time scale. Nevertheless, relatively few ^{227}Ac data are available due to the very low ^{227}Ac concentration in seawater that requires sampling 100s of L for each measurement by nuclear spectrometry. We have developed a protocol to analyze ^{227}Ac and ^{231}Pa by isotope dilution and mass spectrometry, which requires only 10L of seawater. We apply this protocol to archived samples from the Bonus GoodHope/GEOTRACES cruise in the Atlantic sector of the Southern Ocean. A station in the Weddell gyre and another one the southern part of the Antarctic Circumpolar Current (ACC) over the mid-Atlantic ridge have been already analyzed. In the Weddell gyre, the ^{227}Ac excess (unsupported by 231Pa and noted $^{227}Ac_{xs}$) range from 2.1 ± 1.3 in the surface waters to 7.6 ± 1.7 at 3920 m (uncertainties expressed as $2s_n$, 1 ag/kg = 0.161 dpm/m^3), in good agreement with [1]. There is also a ^{227}Ac excess in the ACC up to the surface waters, from 1.8 ±1.2 ag/kg at 60 m to 6.3 ±2.1 ag/kg at 2300 m, over the ridge in agreement with the finding that hydrothermal activity may be a source of ^{227}Ac in the ocean. The full dissolved ^{227}Ac and ^{231}Pa section and selected particulate data will be presented and used to test and constrain the isopycnal-scavenging mixing model over the Bonus GoodHope section already proposed for Th isotopes [2].

[1] Geibert et al. (2008) Mar. Chem. 109, 238-249.
[2] Roy-Barman et al. (2019) Deep Sea Res. 149, 103042.