

Seawater ^{227}Ac analysis by ID-MC-ICPMS: a GEOTRACES challenge

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By diffusing from the sediments into the bottom water, ^{227}Ac (half-life = 21.7y) is a powerful tracer of vertical mixing in the deep water on decade scale. However, its use is limited by its very low concentration resulting large volumes of water required for its analysis (typically 1000 L pumped through MnO_2 -impregnated cartridges for several GEOTRACES cruises before analysis by RaDeCC). We have developed a new method of ^{227}Ac analysis by isotope dilution and MC-ICPMS that significantly increases the accuracy of the measurements and reduce the sample size. After spiking water samples with ^{225}Ac milked from a ^{229}Th solution, actinium isotopes are preconcentrated by manganese co-precipitation, purified them by anion exchange chromatography and then measured by MC-ICP-MS. The reproducibility and limits of the instrument are estimated with a homemade actinium standard solution. The concentration measure on the first samples of 25L from China Sea water range from below the detection limit in surface water ($\sim 0.10 \text{ dpm/m}^3$) to $0.50 \pm 0.17 \text{ dpm/m}^3$ at 2800m depth (uncertainties are given in 2σ). The concentrations measured in the deep China Sea waters entering through the Luzon strait are consistent with previous data obtained in the same water mass in the Pacific Ocean (Nozaki et al., *Oceanol. Acta*, 1997). An internal quality control was carried out to validate our method by repeated measurements of 2L of surface seawater doped with ^{227}Ac ($67,5 \text{ dpm/m}^3$) and duplicates of the Vienne river water ($0.98 \pm 0.29 \text{ dpm/m}^3$ and $0,66 \pm 0.20 \text{ dpm/m}^3$). Combined with REEs data will allow studying the remobilization of trace elements like neodymium in ocean-continental interface areas. These developments will be used to analyse ^{227}Ac in archived samples from the Southern Ocean.