Determination of strontium-90 in seawater using TODGA chelating resin

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Strontium-90 has been observed maximum values at late 1950s, which originated global fallout from nuclear weapons tests, and gradually reduced to about 1mBq/L in the Pacific Ocean (Pavinec *et al*., 2012). The accidents of the Fukushima Daiichi Nuclear Power Plant in Japan and the leak of contaminated water released various radioactive nuclides. Casacuberta *et al*. (2012) estimated that amount of Sr-90 release to the sea based on the observed Sr-90/Cs-137 ratio and Cs-137 by modeling data was 90 - 900 TBq. However, Sr-90 data are limited because of its complicated analytical procedure. Determination of Sr-90 in seawater generally requires preconcentration of Sr and separation from Ca and other beta emitters. In this study, rapid and robust purification technique for the daughter radionuclides yttrium-90 of Sr-90 using TODGA chelating resin (Eichrom) without separation of Sr from Ca. TODGA resin shows high distribution coefficient in high HCl and HNO_3 concentrations.

Sr in seawater (20L) was preconcentrated by oxalate coprecipitation. Precipitates was decomposed to carbonate at 550°C and dissolved in HCl and conducted Fe hydroxide coprecipitaion. After 2 weeks for ingrowth of Y-90, sample was conducted Fe hydroxide coprecipitaion. Pricipitate was filtered and redissolved in 7 mL of 12M HCl. Sample solution was flowed to the column combined anion exchange resin (3mL) and TODGA resin (2mL). Most of seawater matrix such as Sr, Ca and Mg were removed by Fe hydroxide coprecipitation and easily eluted 8M HCl from TODGA resin column. Fe and Bi were adsorbed to anion exchange resin. Pb and Bi were also eluted in 8M HCl fraction. Y was eluted by 20 mL of 0.1 M HCl. Y-90 was measured by low background gas flow proportional counter (Canberra LB-4100).

This analytical procedure was applied to seawater from the Pacific Ocean near the Japan Islands in Janually 2013. Averaged surface Sr-90 concentration was 0.95 ± 0.12 mBq/L, which is comparable to that before the accidents.

Regional modelling of Saharan dust

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The Sahara desert in northern Africa is the world's largest source of dust aerosol. Regional-scale models help to understand processes involved in dust emission, transport and deposition, and are suited for comparisons with results of field studies like the SAharan Mineral DUst experiment (SAMUM) that aimed at improving the estimates of Saharan dust radiative forcing, or at understanding of dust deposition in the oceans. Models of modern atmospheric dust still often show considerable deviations from observations. One cause can be inadequacies in simulated meteorological fields that are used to compute dust emission fluxes. In contrast to global-scale dust models, regional dust models are expected to better reproduce individual dust events due to their higher grid resolution. Still, the representation of dust emission events that are related to precipitation events (haboobs, density currents) is problematic at grid resolutions that require parameterization of wet convection processes. New remote sensing products, together with the observations from recent field studies promise an improved understanding of dust regimes and are expected to lead to considerably improved dust models. We summarize findings of recent multi-year regional dust model studies and discuss open questions.

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