Sources of methane in continental margins: ^{129}I results from gas hydrate systems and fore arc fluids

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Fluids in continental margins are often enriched in methane to degrees which make derivation from local organic sources unlikely. Methane rich fluids also show very strong enrichments in iodine, demonstrating the link between this biophilic element and organic material. Iodine ages derived from the measurement of ^{129}I/I ratios in these fluids can then be used to determine potential source formations for iodine and methane in these settings. Recent applications of this system are investigations of gas hydrates and of fluids collected from the fore arc regions of active subduction zones, such as studies of the fore arc in the North Island, NZ and from gas hydrates of the Peru Margin (ODP 201; H 1230). Pore fluids from Site 1230 are strongly enriched in iodine and show a distinct decrease in ^{129}I/I ratios from 920×10^{-15} close to the surface to 140×10^{-15} at a depth of 200 mbsf. The fore arc fluids from New Zealand are also enriched in iodine and show a similar range in ^{129}I/I ratios. In both cases minimum ages are calculated to be between 40 and 60 Ma for these fluids. Because these ages are older than the host formations of the fluids as well as of the currently subducting sediments, the fluids must be derived from the overriding wedge in these cases. Investigations of gas hydrate systems at Nankai Trough and Hydrate Ridge and of fore arc fluids from Central America and Japan show similar results. Fluids in gas hydrate and fore arc systems are derived predominantly from old formations in the overriding wedge, in contrast to fluids in the main volcanic arc, which show the influence of subducting sediments.

Behavior of stable and radioactive iodine in the global environment

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We report here results of iodine determinations in various geological and environmental materials. ^{129}I/I ratios have also been measured in selected materials such as brines and hot springs collected in Japan to understand the age and origin of iodine. Additionally, ^{129}I levels in the soil environment near the reprocessing plant were studied.

The distribution of stable iodine in the earth's crust was estimated using analytical data in a suite of representative samples. The main reservoirs of the crust's iodine were found to be marine sediments and sedimentary rocks. High iodine concentrations were observed in underground brines. These brines have salinities close to that of seawater and are typically associated with the presence of hydrocarbons. Brine samples from the depth of 1000-2000m in the Kazusa Formation (Chiba Prefecture) showed the highest iodine concentrations of about 130ppm, which were typically more than 2000 times higher than that in seawater. The iodine ages, which were estimated from ^{129}I/I ratios, range between 37 and 53 Ma, and are much older than those of their host sediments. The results obtained for their ages and chemical characteristics indicate that iodine enrichment was caused by mobilization from subducting marine sediments in the fore-arc area and/or by recycling of fluids from older marine formations in the overriding wedge.

Behaviour of iodine in soil-plants-atmosphere system (e.g. sorption on soil, volatilization from soil-plants, effects of microorganisms) was also studied using radioiodine as a tracer.