

Dating of underground brine using I-129

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In order to determine the origin of iodine in iodine-rich brines collected from Boso-peninsula and other areas in Japan, we have analyzed stable iodine and I-129 (half-life: 1.57 Ma). The I-129/I-127 ratios in the brine samples were determined by AMS (Accelerator Mass Spectrometry). The results obtained showed that the I-129/I-127 ratios for the samples collected in Chiba Prefecture are between 153 and 188 E-15 corresponding to ages between 47 and 52 Ma (mean value: 49 Ma). Since these ages are not compatible with the age of the current reservoir formations (ca. 1 - 2 Ma). Our results suggest that the iodine enrichment in the brines was caused by remobilization from subducting marine sediments associated with the release of pore waters in the fore-arc area.

It was also found that iodine was enriched in brine samples (63 - 140ppm) collected from other areas, e.g. Miyazaki, Fukushima, Gunma, Niigata and Akita Prefectures. The range of I-129/I-127 was 162 - 188 (E-15), which corresponding to ages between 39 and 53 Ma.

We also have analyzed pore-water samples from the Nankai Trough area, where gas hydrate deposits are observed. Concentrations of iodine are between 15.2 and 29.6 ppm, i.e. strongly enriched compared to seawater. I-129/I-127 ratios are between 180 and 520 E-15, giving ages between 24 and 48 Ma. Because these ages are considerably older than host sediments (younger than 2 Ma) and subducting marine sediments (younger than 21 Ma) in this area, iodine must have been derived from source formations located in the continental side of the subduction zone.

References

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