Mercury emission into shallow groundwater from subducting slab of Philippine Sea Plate

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Based on the hypothesis that the source of natural mercury contamination occurring in shallow groundwaters (<10 m deep wells) of Osaka Plain, Japan along active faults was dehydrated fluids from the subducting Philippine Sea Plate, concentrations and stable isotopes of mercury of the groundwaters and deep-sea sediments from the bottom surface down to 2200 mbsf (meters below sea-floor) of Nankai Trough were determined.

The deep-sea sediments, contained 140 μg/kg Hg in average. Shallow groundwaters, which appeared about 150 km north from the axis of Nankai Trough, contained a 0.02 to 0.6 μg/L Hg (0.5 μg/L as Japanese standard). Sets of mercury isotope ratios had within small ranges; e.g., δ^{202}Hg of the sediments and groundwaters were -0.2 to -0.8 ‰ and -0.1 and -0.3 ‰, respectively. Δ^{201}Hg and Δ^{199}Hg suggested mass-dependent fractionation without biological differentiation.

The occurrences of contaminated groundwater is coincident to the epicentres of deep low frequency earthquakes, which is believed to relate to the slab dehydration. Results of this study suggested the mercury cycle at convergent margin of northern Philippine Sea Plate as the followings; volcanogenic mercury accumulated in the deep-sea sediments emits along active faults to be trapped in the shallow groundwaters.