Tectonic history of the Nojima and adjacent faults constrained by the fission-track dating of apatite

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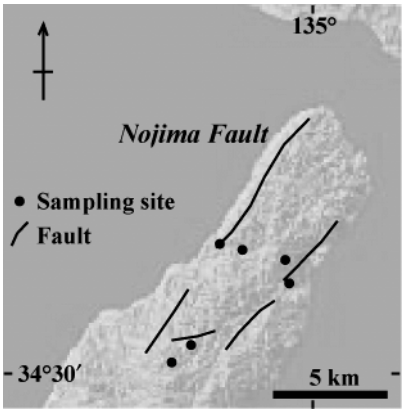
We report apatite fission-track (FT) dating results around Nojima fault, which is the culprit that caused the 1995 Kobe earthquake (Hyogoken-Nanbu earthquake: M7.2). Although zircon FT ages have revealed evidence of heating related to the fault movement (Tagami et al., 2001; Murakami et al., 2002), no apatite FT ages were reported. Our aim is to reveal uplift/exhumation history using apatite FT, which is useful to infer tectonism in the upper crust of less than ~3 km depth. The northern part of Awaji Island started to uplift by ~500 m since 1.2 Ma by fault movement including Nojima, Asano, Kusumoto and Higashiura faults (Murata et al., 2001). If the tectonism had been stable before the Quaternary uplift and the following uplift/exhumation is less than 1 km thick, the apatite FT ages collected at the present surface level should be much older than, say, the Quaternary.

Six outcropping granitic samples including the Nojima fault zone were collected and all of them show high spontaneous fission track densities in apatite, indicating that they are much older than the Quaternary. This supports that the Awaji Island had been stable thermally and tectonically for a long period and then it started uplift in geologically recent time.



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The study on Re and Os removal from seawater to sediments using multitracer technique and XANES

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Rhenium and Os abundances have been reported to be ca. 8 pg/g (Colodner et al., 1993) and 0.01 pg/g (Levasseur et al., 1998), respectively, in seawater and 20-190 ng/g and 0.2-0.7 ng/g, respectively, in black shale (Ravizza et al., 1991), with $^{187}Re/^{188}Os$ ratios of ca. 4300 in seawater and 500-1500 in black shale. These data indicate $^{187}Re/^{188}Os$ fractionation during Re and Os removal from seawater to black shale. Here, the sorption experiments of Re and Os on sediments from seawater was conducted using radioactive nuclides ^{183}Re and ^{185}Os. Rhenium and Os species incorporated in the sediments were studied using Re L_{III}-edge and Os L_{III}-edge XAFS.

In the sorption experiments on Tokyo Bay sediments (total organic carbon content: 2.07%) from synthetic seawater at different Eh conditions, removal behavior of Os from seawater into sediments was shown to be different from that of Re. Osmium was removed into sediments even under mildly oxic condition (Eh = 300 mV and pH 7.5), but not removed into sediments free from organic carbon. This suggests that Os in seawater directly interacts with organic matter in sediments. On the other hand, Re was incorporated into the sediments only under strongly anoxic condition. This suggests that removal of Re into sediments depends on anoxic conditions rather than the effect of organic matter.

Speciation of Re and Os added into the Tokyo Bay sediments under anoxic conditions was conducted by XAFS. XANES spectra suggested that the oxidation number of Os sorbed on the sediments was trivalent, even though Os was doped into synthetic seawater as $Os(IV)Cl_6^{2-}$ and $Os(VIII)O_4$. Since octavalent Os has been considered as the main dissolved species in the ocean (Levasseur et al., 1998), reductive reaction of Os can be an important factor for the accumulation of Os in anoxic sediments. This is consistent with the labile character of trivalent cation which is readily sorbed on various metal oxides and complexed with natural organic polyacids.

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