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Lithium isotopic variation of spring water in the vicinity of Suma fault after 1995 Kobe Earthquake in Japan

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It has been proposed that the island arc deep-crustal fluid has played important role in intra-arc earthquakes (e.g., Iio et al., 2002), although many things, incluing the relationships between the island arc deep-crustal fluid and slab-derived fluid, have been still unresolved. It has been difficult to identify the nature of deep-crustal fluid based on the geochemical researches using underground water recovered from spring and well, because the deep-crustal fluid is very diluted by surface water during ascending. Lithium (Li), the lightest alkali metal, is a fluid-mobile element having two stable isotopes, $^{7}Li/^{6}Li$, with abundances of 92.5% and 7.5%, respectively. Amount of Li leached from rock to fluid drastically increases with the temperature, and once leached Li is kept in fluid while decreasing temperature (cooling). These features indicate that non-traditional Li isotopic tracer has a great potential to provide new insight on the origin of nature of island arc deep-crustal fluid.

The 1995 Kobe earthquake (M7.2) is one of destructive intra-arc earthquake in the past 100 years. Seismic tomography revealed that deep-crustal fluid was contributed to the initiation of this Kobe earthquake (Zhao et al., 1996). The geochemical results have also demonstrated that chlorine contents of underground water in Kobe area increased from August 1994 to just before the earthquake, January 1995 (Tsunogai and Wakita, 1996). This means that the degree of discharge of the chlorine enriched deep-crustal fluid to the surface was increased with the time before the earthquake. The nature of the deep-crustal fluid involving the earthquake has never been revealed. Then, we have analyzed Li isotopic variation of spring water from Suma Reisen since March 1995. The spring, Suma Reisen, is located in the vicinity of Suma fault in the Rokko-Awaji fault zone, of which southern part moved in 1995 Kobe earthquake. We have also researched the Li isotopic compositions of spring water and river water that were recovered from the area around the Suma fault. Based on these results, we will present the nature of the deep-crustal fluid involving the 1995 Kobe earthquake.

References:
Iio et al., 2002, EPSL 203, 245-253.
Tsunogai and Wakita, 1995, Science 269, 61-63.
Zhao et al.,1996, Science 274, 1891-1894.

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