On the $^{3}He/^{4}He$ ratio changes in hot spring water and gas related to the 2008 Iwate-Miyagi Nairiku Earthquake

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It is considered that that aqueous fluids supplied by the slub result in local contractive deformation and increase the local crustal contraction rate in northeastern Japan (e.g. Hasegawa et al., 2005). However, the presence of aqueous liquid is only estimated by the seismic velocity anomalies and it is supposed to be difficult to detect directly what kind of aqueous liquid is upwelling by geophysical studies. A $^{3}He/^{4}He$ ratio could be a good indicator to distinguish the origin of fluid because the helium isotopic ratios in the mantle and crust are quite different each other.

The Iwate-Miyagi Nairiku Earthquake in 2008 occurred on 14 June 2008. The epicenter was 39.028 N 140.88 E with the magnitude M7.2 (outlined information released from Japan Meteorological Agency).

We have collected water/gases samples from hot springs near the epicenter of the earthquake in two periods (a week and half a year after the earthquake) for the purpose of studying the change of $^{3}He/^{4}He$ ratios related the earthquake. A $^{3}He/^{4}He$ ratio and He and Ne concentrations of the dissolved gases were measured by using the noble gas mass spectrometer (VG 5400) installed at Osaka University.

Our results show that $^{3}He/^{4}He$ ratios increased in many hot springs in this region by 10-85% after a week. Later, $^{3}He/^{4}He$ ratios decreased at the nearest point of the main shock region after half a year. In the northwest part of the main shock region, the isotopic ratios were futher increased. These results suggested that there was an uplift of the mantel material containing the primordial ^{3}He-containing fluid and this could be the cause of the earthquake. We plan to compare these geochemical results with the geophysical data in this region.