

Spatial distributions of mantle helium and deep-seated carbon in northeastern Japan

HORIGUCHI, Keika^{1*}, MORIKAWA, Noritoshi¹, TAKAHASHI, Hiroshi¹, KAZAHAYA, Kohei¹

¹Geological Survey of Japan, AIST

On the basis of a progressed seismograph network in recent years, geophysical studies indicate detailed structure and transportation paths of fluids in subduction zone, northeastern Japan (Hasegawa et al., 2005). The presence of fluid is presumed by the seismic velocity anomalies, however, it is difficult to detect directly what kind of fluid is upwelling from geophysical studies. We focus on showing an outline of the geographical distribution of mantle helium and deep-seated carbon obtained from hot spring water/gases in northeastern Japan.

We have collected water/gases samples from hot springs throughout the northeastern Japan and analysed the helium isotope ratio ($^3\text{He}/^4\text{He}$) and the deep-seated carbon concentration (Cds) both of which are good indicators to distinguish the origin of fluid. Helium-3 is originated from mantle and Cds is considered to be derived from the slab.

Spatial variation clearly showed the high $^3\text{He}/^4\text{He}$ ratio and Cds in volcanic front and back-arc region in northeastern Japan. However, the distribution has regional variation. The geographical distributions of $^3\text{He}/^4\text{He}$ ratio and Cds observed at the surface are found to be similar to that of seismic low-velocity zone of wedge mantle. The distribution of seismic low-velocity zone is thought to be resulted in the existence of fluids, partial melts or mantle diapirs. Therefore, the similarity of the distributions may represent that there are some fluid path for the upwelling the helium and carbon species to the surface from the underlying seismic low-velocity zone.

Keywords: helium isotope ratio, deep-seated carbon, northeastern Japan, fluid