MANTLE HELIUM NEAR SOURCE ZONES OF STRONG EARTHQUAKES AND LARGE DEEP FAULT ZONES

YURI KOPNICHEV 1, Inna Sokolova 2

1. Institute of the Physics of the Earth, Russian Academy of Sciences, Kamo 8a, Talgar, Almaty reg., 483310 Kazakhstan.
2. Institute of Geophysical Research, National Nuclear Center Republic of Kazakhstan

We have been analyzing the data on variations of helium isotope content (parameter R=3He/4He) in groundwaters near source zones of strong earthquakes and large deep fault zones. The primary data on helium isotopes have been obtained by different authors in the regions of Tien Shan, Mongolia, California, Central Honsu and Central Apennines. In many cases a regular decay of R values is observed, when moving away from epicenters of strong earthquakes and zones of large regional deep faults (at distances up to ~200 km). This testifies to ascending mantle fluids into the upper crust after large earthquakes and in some deep fault zones, which are characterized by super high permeability, and a following migration in horizontal direction. This correlates with seismic data on temporal variations of shear wave attenuation field in the uppermost mantle and the earth's crust prior to and after large and great earthquakes [Kopnichev et al., 2000; Kopnichev and Sokolova, 2003], on variations of Lg/Pg amplitude ratio from recordings of underground nuclear explosions at the Semipalatinsk test site for paths, crossing Tien Shan [Kopnichev and Sokolova, 2004] and on variations of Vp/Vs ratio in the source zone of the great Antofagasta earthquake of 1995 [Husen and Kissling, 2001]. We have estimated velocities of fluid migration in the upper part of the earth's crust using seismic and geochemical data. An analogy between effects of large earthquakes and volcanic eruptions is discussed, which consists in releasing light material from the upper mantle.