

Analyses for long-term changes of geothermal systems using radiometric dating

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In order to evaluate effects of geothermal anomalies at high-level radioactive wastes disposal sites, information on long-term development and possible future activity of geothermal systems are needed. The only method to measure the time in the geothermal history is radiometric dating resetted by geothermal heat, such as electron spin resonance (ESR) and thermoluminescence (TL) methods.

Previous studies reported historical shift of surface manifestations for some kilometers in 0.1 m.y. by TL dating, and repose intervals of 0.4 m.y. by TL dating and 0.01 - 0.02 m.y. by ESR daing.

Unfortunately, we have no more quantitative information on long-term geothermal activity because reports and researchers are insufficient. Further systematic studies on radiometric dating in present and past geothermal fields are needed to make guidelines for radioactive wastes disposal siting.

The auther carried out systematic dating using ESR method for quartz phenocrysts extracted from geothermally altered tuff in the Kawarage geothermal field, Akita Prefecture, northeast Japan. 32 samples were measured and E' center, Al center and Ti center signals were detected from all samples. Ages calculated using Al center signal were 20 - 40 ka except 4 samples from peripheral locations, and all ages are much younger than their eruption ages. E' center signal suggests geothermal heating because it has not detected from quartz phenocrysts in non-altered tephtras.