

Post-Neogene uplift and hydrothermal activities of Kii Peninsula, southwest Japan by using FT dating data

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Introduction

This study is aimed to the estimate of uplift rate and hydrothermal activities at the southern part of Kii Peninsula as a case study, by using apatite FT dating data. Additionally the applicability of the technique was examined by the comparative of the result of tectonic geomorphological estimate.

Estimation of uplift rate of Kii Peninsula

Apatite FT age of unaltered rock samples from the Shimanto Terrane of Kii peninsula show the tendency that becomes young from north section (ca. 37 Ma) to south section (ca. 6 Ma), although the value of ca. 15 Ma are shown near boundary of the Chichibu Terrane and the Median Tectonic Line. At the southern part of Kii Peninsula, apatite FT age show 13 ~2.5 Ma in general and those age of unaltered samples show around 11 Ma and 8 Ma. These age are thought to show the reset age of burial metamorphism. Average uplift rate calculated that closure temperature of apatite FT age assumed to be 130 deg C, geothermal gradient assumed to be 3 deg C / 100 m, and surface temperature assumed to be 15 deg C, ca. 3.5 m / 10,000 years as 11 Ma, and ca. 4.8 m / 10,000 years as 8 Ma. These values harmonize with the estimated value by using geology and erosional low-relief surfaces (4 ~5 m / 10,000 years).

Amagmatic hydrothermal activities of Kii Peninsula

Several high-temperature hot springs, like as Yunomine hot spring, are distributed in the southern part of Kii Peninsula, though no Quaternary volcanoes exist in neighborhood. Hongu area is known as geothermal anomaly area, distributed alteration zones formed by hydrothermal activities. As the results of apatite FT dating of the altered rock samples from these area, the area that shows ca. 6 Ma apatite FT age includes hot spring. This result suggests that these area are effected the hydrothermal activities related to the formation of hot spring. Formation of these high-temperature hot spring are thought to have relevance to the deep fluid formed by dehydration of slab resulting from subduction of the Philippine Sea Plate, since helium isotope ratio of hot spring gas show high ^3He and the subduction of the Philippine Sea Plate are thought to start at that time. Apatite FT age of Yunomine hot spring area, with high ^3He gas, shows ca. 2.5 Ma. That result suggests the continuous hydrothermal activity at restricted area.