

フィッション・トラック熱年代に基づいた 六甲地域の冷却・削剥史

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Cooling and Denudation History of the Rokko Area, Southwest Japan, Based on Fission-track Thermochronology

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Abstract

Quantitatively estimating denudation is generally difficult because it essentially involves the removal and loss of materials in situ. The denudation rate of mountainous areas in Japan has commonly been studied from the volume of sediment in a basin or catchment. Nonetheless, the availability of these methods is constrained spatially by upstream area and temporally by depositional age. In the last few decades, thermochronometric methods that evaluate thermal history using radiometric-dating methods have been used to evaluate the denudation and tectonic history of orogenic belts around the world. The advantages of thermochronometric methods are that we can calculate the denudation rate at each sampling point and that combining multiple methods and/or target minerals enables us to calculate denudation rates in multiple periods. However, thermochronometric methods have been applied to areas with extraordinarily high denudation rates in island arc areas such as Japan. Thus, the effectiveness of thermochronometric methods for estimating denudation rates in island arc areas has not been demonstrated. We applied apatite and zircon fission-track thermochronometry to granitic rock samples collected from outcrops and a borehole to estimate the tectonic history of the Rokko area, southwest Japan. Previous studies suggested that the Rokko Mountains have been uplifted by active faulting along their northern and southern margins during the Rokko movements, a Quaternary tectonic movement in the Kinki district. However, the tectonic history of the Rokko area prior to 1 Ma has not been revealed due to a lack of prevalent geologic markers. We estimated average denudation rates in various periods based on apatite and zircon FT ages and previously reported radiometric ages. We obtained denudation rates at about 0.04–0.10 mm/yr after about 30 Ma,

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0.05-0.7 mm/yr during 50-30 Ma, 0.7-4.0 mm/yr during 70-50 Ma. The denudation rate after the deposition of the Kobe Group (36.9-30.4 Ma) is estimated to be in the 0.01-0.1 mm/yr order, while bedrock uplift rate after about 1 Ma is estimated to be about 0.5 mm/yr. Thus, the tectonic activity of the Rokko Mountains area prior to 1 Ma has been relatively low.

Key words : fission-track dating method, thermochronology, denudation rate, Rokko area, LA-ICP-MS (laser ablation inductively coupled plasma mass spectrometry)
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