Dating of marine erosional terraces using cosmogenic nuclides: A case study of the Hyuga City, Miyazaki Prefecture, southwest Japan (preliminary results)

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Uplift rate in an inland region and coastal region in the past 10^4 to 10^5 years can be estimated based on the elevation and emergent age of marine terraces (e.g., Ota and Omura, 1991). Marine depositional terraces in Japan have been dated by using radioactive carbon dating, tephrochronology, and recently developed optically stimulated luminescence dating (especially pIRIR dating for feldspar; e.g., Ito et al., 2015). On the other hand, it is difficult to date marine erosional terraces which lack sedimentary layers on the surfaces to apply these dating methods.

This study attempted to date marine erosional terraces by using terrestrial cosmogenic nuclide (TCN) dating methods, especially ^{10}Be and ^{26}Al methods. The ^{10}Be and ^{26}Al methods can reconstruct an exposure age and/or erosion rate of a rock based on the contents of ^{10}Be and ^{26}Al which are produced by irradiations of cosmic rays to oxygen and silicon in the rock (Wakasa et al., 2004; Matsushi et al., 2007). The production rates of ^{10}Be and ^{26}Al at the surface or at a certain depth depend on the cosmic-ray intensity (related to the latitude and altitude), density of the covering materials, and depth of the rock. The cosmic-ray intensity is computed theoretically, and the density of the covering materials can be also measured or assumed. Therefore, time-depth process of the rock, namely erosion and deposition history at the site, can be constrained by measuring the ^{10}Be and ^{26}Al contents.

We studied marine erosional terraces in Hyuga City, Miyazaki Prefecture, southwest Japan. Three groups of marine terraces were identified in this region, which are hereinafter named M1, M2 and L surfaces, respectively. The elevations of the surfaces are 30-50 m for M1 surface, 19-30 m for M2 surfaces, and sea-level to ~8 m for L surface. Considering the elevation, M1 and M2 surfaces can be correlated to the Sanzaibaru surface and Nyutabaru surface (Nagaoka et al., 2010), respectively, whereas L surface is thought to be the Holocene terraces. We collected rock samples for TCN dating by excavating three pits on M2 surface. The cross-sections of the pits consist of the basement rock, angular to subangular gravel layer interpreted as *in-situ* weathered basement rock, and soil from the base to the top. Rock samples were collected from the top of the gravel layer (depth: ~50 cm to 1 m) which is thought to be the surface of the former wave-cut benches. The lithology of the samples is the granite porphyry of the Osuzuyama acidic rocks formed in the middle Miocene (Nakata, 1978). The samples were processed by following the procedures of Kohl and Nishizumi (1992) and the ^{10}Be and ^{26}Al contents were measured using JAEA-AMS-TONO, an accelerator mass spectrometer at the Tono Geoscience Center, Japan Atomic Energy Agency (Saito-Kokubu et al., 2013).

The ^{26}Al contents measured were rejected because these values were lower than the theoretical values. The ^{10}Be contents yielded ~100 to 70 ka of the minimum exposure ages. More realistic erosion/deposition scenarios were adopted for better dating of the terrace surfaces, in which sedimentary layers were assumed to be deposited at a constant rate after the emergent of the surface. Consequently, M2 surface is thought to be emerged in MIS 5a although the correlated Nyutabaru surface emerged in

MIS 5c. We are planning to determine more accurate age of the surfaces by tuning model parameters and by obtaining depth profiles of TCN contents.

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