Crustal rebound inferred from gravity anomalies and uplifted Late Pleistocene marine terraces in eastern part of Kyushu, Japan

Michitaka Tahara[1], Masao Nakada[1], Hiroshi Shimizu[2], Shinji Nagaoka[3], Kenji Uehira[4], Sadaomi Suzuki[1]

[1] Earth and Planetary Sci., Kyushu Univ, [2] Inst. Seismol. & Volcanol., Kyushu Univ., [3] Dep.Geography,Fac.Education,Nagasaki University, [4] SEVO, Kyushu Univ.

The Miyazaki Plain, eastern part of Kyushu, Japan, is characterized by both significant negative gravity anomalies and aseismic crustal uplifting (about 1 mm/yr) in the Late Pleistocene and Holocene. In this study, we quantitatively examined the relationship between these two phenomena. We estimated the mass deficiency (underplating load) below 11 km depth by using the gravity anomalies and P-wave velocity structure of the upper crust. The onset of the load accumulation, 0.5-0.4 Ma, was inferred from the movement of the fluvial terraces considering the tephrochronology. The loading history is assumed to be a linear function of time. Then, we quantitatively evaluated the crustal rebound by assuming a viscoelastic plate deformation to an underplating load existing at 20 or 30 km depth. As a first approximation, the predicted crustal movement for models with a lithospheric (crustal) viscosity of 10^23-10^24 Pa s can explain the observed altitudes of the shoreline of the marine terraces formed at the Last Interglacial of about 125 kyr BP and the middle Holocene of 5-6 kyr BP. While we cannot restrict the origin of the buoyant body (underplating load), the buoyant body off the Miyazaki Plain may play an important role on the interaction between the subducting oceanic slab and the overriding forearc crust. Thus, the observed lateral variation of the inter-plate coupling on the convergent boundary along the Nankai Trough may be attributed to the existence of the buoyant body. In order to examine these problems, it is highly required to investigate the focal mechanism of the crust and seismological deep structure off the Miyazaki Plain.