The subsurface structure of the Median Tectonic Line, western Shikoku, Japan, based on a gravity survey

*Shin Koshiya[1], Genga Goto[2], Tatsuya Ishiyama[3], Hiroshi Sato[3], Naoko Kato[3], Motonori Higashinaka[4]

1. Department of Civil and Environmental Engineering, Faculty of Science and Engineering, Iwate University, 2. Graduate School of Arts and Sciences, Iwate University, 3. Earthquake Research Institute, University of Tokyo , 4. JGI Inc.

The Median Tectonic Line (MTL), which is more than 1000 km long, is the most important fault in Japan. MTL trends E-W and can be divided into two categories in western Shikoku; the material boundary MTL and the active fault MTL. The former is the boundary fault between the Sambagawa metamorphic belt, and the Rhoke metamorphic belt or the Cretaceous Izumi Group. The latter consists of a few traces of active faults, including Komatsu and Okamura faults. The geological relationship between the material boundary MTL and the active fault MTL, however, has not yet been established. In the paper, we deduce the subsurface density model, which shows geological formations, based on a gravity survey as well as seismic profiling to clarify the relationship.

The gravity survey was conducted along a N-S trending line, ca. 9.5 km long, across the material boundary and active fault MTLs with Scintrex CG-5 gravimeter. The locations of observation sites were surveyed with RTK-GPS instruments. Each interval between observation sites is ca. 200 m. Acquired gravity data was processed to obtain Bouguer anomaly mostly according to the methodology of Geological Survey of Japan, AIST (2004). We assumed that the density for Bouguer and terrain corrections were 2.5 g/cm^3 according to Ito et al. (1996), which has estimated the subsurface geological structure of MTL in eastern Shikoku. Along the survey line, Sambagawa metamorphic rocks, the material boundary MTL, the Izumi Group, one of the active fault MTL (Okamura fault), Plio-Pleistocene Okamura formation, other of the active fault MTL (Komatsu fault), and coastal sediments distribute form the south to the north,

Obtained Bouguer anomaly shows lower value at the northern margin of the line, and higher value around the southern margin, where Sambagawa metamorphic rocks distribute. The difference between these values is about 19 mgal. We assume five layers in our model, which have densities of 2.55 g/cm^3 (layer 1), 2.73 g/cm^3 (layer 2), 2.60 g/cm^3 (layer 3), 2.55 g/cm^3 (layer 4) and 2.20g/cm^3 (layer 5). They can be correlated with Shimanto belt, Sambagawa belt, Rhoke Belt, Izumi Group and Okamura Formation, respectively.
The model shows the trace of the material boundary MTL, dipping ca. 30 degree west, and also strongly suggest Okamura fault dips to the north with a shallow to intermediate angle. This may mean that Okamura fault converges with the material boundary MTL in the underground.

References

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