Japan Geoscience Union Meeting 2013
(May 19-24 2013 at Makuhari, Chiba, Japan)

SCG68-P15 Room:Convention Hall Time:May 23 18:15-19:30

Gravity anomaly and density structure in western Shikoku region

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In Shikoku region, metamorphic belts parallel to the trench axis of the Nankai trough are developed and deep low-frequency tremors and slow slips occur on the surface of the subducting Philippine Sea plate. We conducted gravity survey along three profiles, one along E-W direction and two along NNW-SSE directions. We repot here gravity anomaly on the three profiles and in western Shikoku.

The gravity data we analyze here include 132 new measurement data along the profiles and data measured by other institutes (Honda et al., 2013; Geospatial Information Authority of Japan, 2006; Geological Survey of Japan, 2004: Gravity Research Group in Southwest Japan, 2001). We adopt the density of 2,300 kg/m3 for the Bouguer correction and terrain correction. We calculate the terrain correction using the method of Honda and Kono (2005) with 50 m mesh digital elevation map data.

The gravity anomaly in western Shikoku region is highest in the Pacific Ocean side and becomes lower toward the Seto inland sea as a long wavelength trend. Some variations in the gravity anomaly with short wavelength, which are reflect shallow geological structures, are included in the long wavelength trend. The gravity anomaly, however, differs by about 5-10 mgal even in the same metamorphic belt, suggesting that the difference reflects the difference of deep density structures. In this study, we construct a density structure model from the surface to the Philippine Sea plate and examine how much modification of structure boundaries and/or densities is needed to satisfy the observed gravity anomaly.

Acknowledgments: We thank the Geospatial Information Authority of Japan, Geological Survey of Japan, and The Gravity Research Group in Southwest Japan for providing gravity data.

Keywords: gravity anomaly, density structure, western Shikoku, metamorphic belt, Philippine Sea plate