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Gravity analysis on Crustal Structures along the 1997 Iwaki-Kamaishi Explosion Experiments -4-

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The purpose of this study is to verify the P-wave velocity structure constructed by a ray-tracing method from the large explosion seismological experiments and to obtain a general crustal structure along the Iwaki-Kamaishi profile with gravity anomaly data. This analysis using gravity data will provide some useful insights on the shallow structure of the crust. We have introduced some inconsistencies of velocity structure and density structure through conferences, repeatedly. But the consistent models have never obtained yet.

The Kamaishi-Iwaki seismic profile is one of the most extensive explosion seismological investigation profile in the northern part of Honshu Island, Japan, 1997 [Reserch Group for Explosion Seismology, 1998], and Iwasaki et al.(2001) presented a detailed P-wave whole crustal velocity structure in this region.

We examine this velocity structures with gravity anomaly data applying 2D-Talwani's method as we describe below. We regard P-wave velocity structure models as reliable model and divide into 13 layers without changing boundary model of each layer. First, we convert median P-wave velocities of each layer into rock densities employing an empirical relationship between seismic velocity and rock density. This model, however, do not agree with the gravity anomalies.

Therefore we calculate the RMS misfit between observed gravity anomalies and calculated one changing densities of layers at 0.01 g/cc interval within limits velocity - density relationship. However the minimum of this RMS misfit is 8.82 mGal and we cannot obtain consistent theoretical gravity anomalies. Especially over the Tono region, where large granitic bodies is thought to have intruded during the Cretaceous period exist, P-wave structure cannot explain the gravity anomalies at all. Therefore we assumed that a granite pluton whose density is lighter than surrounding rocks' by about 0.08 g/cc, insert in an advanced model. Similarly, we take Miyamori ultramafic complex into consideration. We assume the density of this body is heavier by 0.10 g/cc, and also insert.

In this model, the depth of the diapir-shaped granite pluton is considered to be no deeper than 6 kilometers. Our model is not consistent with P-wave velocity structure, but consistent with gravity anomalies and geology in this region.