Preliminary report of the airborne gravity measurement in the Noto Peninsula (March 2006)

Jiro Segawa[1]; Hideki Katagawa[2]; Masaaki Hamada[2]

[1] Tokyo Univ. Mar. Sci. Tech.; [2] Civil Eng., Rikuden

From 24 to 27 March in 2006 an airborne gravity measurement was conducted in the Noto Peninsula and the surrounding sea using a helicopter Bell-412. The height of the measurement was 2000ft (610m) along 11 tracks which are 20 to 30 nautical miles long with 5 nautical mile spacing. 8 tracks out of 11 run east to west, and the rest south-south east to north-north west. In addition, all the tracks were flown back and forth repeatedly so that the repeatability of the measurements can be confirmed.

The objectives of the gravity measurement by helicopter are to get consistent gravity values using land, marine and air gravity data in the Noto Peninsula, the Sea of Japan and the Toyama Bay at the same time so that reasonable subcrustal structures over the coastal borders may be obtained.

The airborne gravimeter used is SEGAWA-TOKIMEC Model FGA-1 (1998). The gravity sensor is of the servo-accelerometer type whose verticality is controlled by an optical fibre gyro. Since the measurement is usually conducted with the flight speed of 90 knots and 1-sec read-out interval the gravity data are obtained every 45m. The resolution of gravity signals is 2.5km (half wavelength). The raw gravity data are processed so that the free-air gravity anomaly and the Bouguer gravity anomaly with terrain correction assuming the rock density as either 2.00 or 2.67 gram are provided.

The comparison between land, sea and air gravity is made by making the upward continuation processing up to the height of airborne measurement. The downward continuation is avoided because the noise of measurement is exaggerated.

Outline of the results of measurement:

1) If you compare the airborne Free-air gravity anomaly with that on land the former looks smoother than the latter. This is because, particularly on the rugged mountains, the land gravity at the valley is unusually lowered due to the attraction of the upper mass of the mountain.

2) As for the Bouguer gravity anomaly it is calculated by applying terrain corrections. In this case the density of rock is assumed to be either 2.00 or 2.67 gram. The reason why the Bouguer anomaly from the airborne measurements undulates more than that from land measurements is that part of the gravity signals of airborne measurement is subject to smoothing together with the noise of helicopter because of the strong low-pass filtering. In order to remove this sort of inconveniences the terrain corrections may also be smoothed to some extent.

3) In order to verify the reliability of measurement we applied a cross-over check to the measurement. We have 24 crossovers of the tracks of measurement during the survey of the Noto Peninsula. By averaging the absolute values of the crossover differences we have a value of 2.7 mgal. This is regarded as a measure of reliability.

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