# Application of helicopter gravimetry to improve the accuracy of geoid and to survey active faults on the continental shelves

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We have been devoting ourselves to the development of the helicopter-borne gravity measuring system since 1998 and now we believe that we have attained a certain necessary level of measurement. So, for the last three years, we have been trying to apply the gravity measurement from the sky to detecting continuation of active faults observed on land overseas as well as improving the accuracy of geoid in the land-to-sea boundaries where gravity data are lacking.

Practical measurements of gravity by helicopter began in 2000, and we carried out the measurements at a pace twice a year with 10 to 12 hour flight each. The gravimeter used is a SEGAWA model made in Japan manufactured with the aid of NEDO (New Energy and Industrial Technology Development Organization). We use a helicopter Bell 412 which is specially adjusted for our gravity measurement. Our measurements focus on the Japanese Island at present, though we have a plan to extend them to Antarctica in future. The areas where we made measurements in three years include Kanto District offshore to Kashima-Nada Sea, Tokai District from Omaezaki Peninsula westward to Ise Bay, and Kozu Shima to Miyakejima. Among these measurements we select two cases here and explain in details.

1) FINDING REGIONAL ERRORS IN MARINE GRAVITY AT KASHIMA-NADA SEA

This measurement was conducted in April 2000. The measurement covers the area from Saitama Prefecture to Kashima-Nada Sea via Ibaraki Prefecture along a west-to-east straight course with a distance 120 nautical miles. On this course, the western half passed a land area, whereas the eastern half passed a marine area. The measurement proved to be extremely convincing, showing the bias error of 0.5 mgal and SD 1.5 mgal if the onward and backward measurements are compared. This should be objective evidence to know the reliability of measurement. We checked this data against land/sea truth data. Then, it showed a beautiful agreement in values within the land area, but, on the contrary, it showed a discrepancy as large as 15 mgal over the marine zone. This result implies a large error involved in the past marine gravity measurements. Therefore, our helicopter measurement would contribute hereafter to the improvement of gravity measurement at coastal zones hence the enhancement of accuracy in the geoid estimation.

2) IDENTIFYING MARINE ACTIVE FAULTS ON CONTINENTAL SHELVES

From the measurement conducted in 2002 we have found the continuation of one of the active faults on land called 'Akaishi Fracture Zone' over to the continental shelf in the Tokai District. It is well known that a tectonic fault is reflected on free air/Bouguer gravity anomaly. The Akaishi Fracture Zone which runs parallel to the Tenryu River, one of representative rivers in the Southwest Japan, is an active fault related to Tokai Earthquake. By the four tracks of flight we have confirmed the continuation of gravity anomalies attached to the Akaishi Fracture Zone over the coastal lines. Although the gravity is strongly affected by the sea bottom topography it is certain that the gravity anomalies show the fault continuation overseas.