

Gravity Survey in the Nansei-Shoto Islands – Preliminary Report –

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1. Introduction

Gravity measurements were carried out over major islands in the Nansei-Shoto Islands.

Their names are, from north to south: Amami-Oshima, Kikaijima, Tokunoshima, Okinoerabujima, Okinawa Main Island, Miyakojima, Ishigakijima, Iriomotejima, Haterumajima, and Yonagunijima. Although Minami-Daitojima and Kita-Daitojima are not belonging to the Nansei-Shoto Islands in geographical sense, but close to them, we report results on these islands here.

2. Previous works of gravity measurements in the Nansei-Shoto Islands

Geographical Survey Institute settled fundamental gravity stations in major islands in this region.

Geographical Survey Institute did extensive gravity measurements on Okinawa Main Island, Amami-Oshima and Yoronjima.

Yokoyama (1972) reported distribution of gravity anomalies over Amami-Oshima by using 61 points.

In 1974, we carried out gravity measurement in Miyakojima to explore subsurface caves in this island.

Tomoda et al surveyed gravity anomalies over Minami Daitojima in 1974 at 82 points, and the later, Kono et al. (1980) carried out gravity measurements not only Minami- Daitojima but also Kita-Daitojima at 88 points.

There are some information on gravity measurements in Okinawa Main Island and Miyakojima for a purpose of gas or oil explorations, but details are not available.

3. Outline of gravity measurements in this region performed by Kanazawa University

We carried out gravity measurements in the Nansei-Shoto Islands except Minami Daito and Kita Daito islands during 2000 to 2004.

Gravity values were determined by using a fundamental gravity station in Kanazawa, which was settled by Geographical Survey Institute. On the courses of measurements, we visited fundamental gravity stations in major islands in the Nansei-Shoto islands and crosschecked accuracy of measurements. Before departures and after arrivals by using airplanes, we measured either at fundamental gravity stations or temporal stations in airports to ensure gravity values during transportation.

Elevation of gravity stations were determined by employing reported height of either Bench Marks, Triangulation Points or Spot Heights. If they were not available, we estimated elevation by interpolating contour lines in 1:25,000 topographic maps. We also used two barometric altimeters to confirm height estimations. Portable GPS was used for coordinate confirmation. We confirmed remarkable discrepancy of coordinates of 1:25,000 maps in several islands.

Areas of islands (in km²) and gravity points measured by us are as follows: Yonaguni: 28 km², 63 points; Hateruma: 13, 29; Iriomote: 288, 63; Ishigaki: 223, 168; Miyako/Irabu: 188, 162; Okinawa: 1183, 196; Amami Oshima: 719, 273; Kikai: 57, 85; Minami-Daito: 31, 21; Kita-Daito: 13, 67.

Due to absence of traffic roads in central, southern and southwestern part of Iriomotejima Island, measurement points are restricted northern and eastern part of the island.

Gravity stations in Ishigakijima Island well cover over the whole area except Omoto mount (526m), which is situated in central part of the island.

Miyakojima, Irabujima, Shimojishima, Kurimajima, and Ikemajima Islands are covered by Quaternary limestone and are topographically flat. Gravity stations well covered whole of these islands.

Okinawa Island is the largest one in the Nansei-Shoto Islands. Highest top of this island is 496m. We measured gravity all parts of the islands.

Amami-Oshima and its surrounding islands (Kakeroma, Yoroshima and Ukeshima) have rugged topography (highest point is 694m). Our stations cover all part of the islands.

Kita-Daito and Minami-Daito Islands are uplift coral reefs. We covered gravity stations evenly all over these islands.

Distribution of gravity anomalies over each islands and regional distribution of gravity anomalies will be shown in the next report.