The Gravity Database of Southwest Japan: Application to the Tokai District

Ryuichi Shichi[1], Akihiko Yamamoto[2], Takeshi Kudo[3], Mikio Satomura[4], Toshiyuki Tanaka[5], Yoshimi Sasaki[6], Ryuji Ikeda[7]

[1] Coll. Eng., Chubu Univ., [2] Institute of Seismology and Volcanology, Hokkaido Univ., [3] TGC,JNC, [4] Fac. of Science, Shizuoka Univ., [5] TRIES, [6] Faculty of Educ., Gifu Univ., [7] HOKUDAI

From the point of view of earthquake hazards, an attention has been focused on the Tokai District, central Japan. By using gravity databases published recently, we made a detailed and up-to-date gravity anomaly mapping in the Tokai area whose actual geographical location lies between 34 degree-25 minute to 35 degree-45 minute north latitude and 136 degree-20 minute to 138 degree-40 minutes east longitude. This region is known to be a seismic source region of the forthcoming great earthquakes 'Tokai and Tonankai

Earthquakes'. Data sources we used for mapping are 'Gravity Database of Southwest Japan' published by the Gravity Research Group in Southwest Japan (2001), selected data files contained in 'Gravity CD-ROM of Japan' published by the Geological Survey of Japan (2000), and unpublished gravity data provided by the Geographical Survey Institute. Although the data coverage, particularly in the widely distributed rugged mountainous region such as Akaishi mountain range, is not enough nor uneven for tough discussion, the area is covered by 26,777 dense gravity data with an accuracy to guarantee a precision of 1 mgal. We produced a new precise gravity anomaly map in the Tokai District based on these data. Main features delineated by the map are briefly summarized as follows;

(1) Arcuate-shaped high gravity gradient, protruding northward and centered at or near the mouth of the Tenryu River, clearly develops in the southern part of the Tokai area, forming a belt-like structure of 20 to 30 km width, and runs from the southernmost part of the Chita Peninsula to Shimizu city passing through south of the Atera Fault. The Tokai area is in large part covered by this high gradient belt whose central portion is sharply cut by the NNE-SSW trending Akaishi Tectonic Line (ATL) down-dipping toward east.

(2) South of 35 degree north latitude toward the Pacific Ocean, the younger outer zone (southern part) of the Median Tectonic Line (MTL) is marked by a gravity pairing of low and high anomalies prevailing around Toyohashi city and north of the Lake Hamanako, respectively. This gravity swelling forms an oval-shaped area with a diameter of about 30 km and is closely correlated with surface geology. Basic-ultrabasic formations (Mikabu greenstone complex and Sanbagawa metamorphic rocks) mark the center of this gravity

swelling 10 km northeast of the Lake Hamanako, whose easternmost margin is abruptly cut by the ATL.

(3) The gravity high north of the Lake Hamanako is also in contact with another well-defined gravity depression innerward (northern part) of the MTL, corresponding to the ring-shaped Shidara volcanics (Shidara Cauldron), whose southern edge appears to be truncated by the MTL. It should be stressed that the anomaly contour clearly outlines the shape of the cauldron and the MTL here sharply separates this gravity high-low pair as a linear density boundary.

(4) A steep gravity gradient occurs along the Yoro Fault which is characterized by a reverse fault, steeply down-dipping eastward, with wide flexure zone (roughly 1.5 km wide). While the Isewan Fault, down-dipping westward, coincides approximately with a Bouguer anomaly belt with gentler gradient. These facts can be interpreted to reflect that both of these faults constitute intricate hinge structure in relation to the formation of the Kuwana Fault System and the Tempaku River Fault.

(5) In the northeastern margin of the Nobi Plain lies a prominent gravity high of the order of 10 to 15 mgal, which forms almost square in shape with 20-km-long each side and produces a bumpy and wrinkled appearance partly with en echelon features. This high anomaly zone also delineates moderate-scale conjugate features of the Byobuyama Fault, implying that accumulated fault movements are reflection of the E-W oriented compressional tectonics in this area.