

An application of the generalized Bouguer anomaly (1): gravity-density mapping around Mt. Fuji

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The authors present an example of estimating lateral density distribution (gravity-density mapping) over the area of 80 km x 65 km around Mt. Fuji as an application of the generalized Bouguer anomaly proposed by Nozaki (2001) and Nozaki & Iwamoto (2001).

Based on the newly defined formula of the generalized Bouguer anomaly, the authors derive an approximate equation that gives the relation among free-air anomaly, topography, Bouguer density, regional anomaly of vertical gradient of gravity (regional VGG anomaly), and special datum levels which are so adjusted as to satisfy the condition of eliminating the topographic gravitational effects. Under some assumptions, such as regional VGG anomaly is zero, etc., this equation can be used for estimating the local Bouguer densities.

By applying the equation to the gravity-density mapping technique, the authors have made a feasibility study over the area of 80 km x 65 km around Mt. Fuji with a mesh size of e.g. 1 km x 1 km. The density distribution map thus obtained shows an interesting pattern of lateral density variations that may reflect the local subsurface density anomalies, ranging from 1.7 g/cc to 2.8 g/cc roughly in the area of high topographic relief (e.g. with a gradient of more than 10 %). However, in the flat areas, typically with a gradient of less than 5-10 %, the estimated densities become unstable. This will be a future problem.

References:

- Nozaki (2001): Generalized Bouguer gravity anomaly (1), ASEG Extended Abstract, Aug. 5-8, 2001, Brisbane, Australia.
- Nozaki & Iwamoto (2001): Generalized Bouguer gravity anomaly (2), ASEG Extended Abstract, Aug. 5-8, 2001, Brisbane, Australia.