

The Terrain Density Distribution Inferred from Gravity Inversion in the Ishikari Region, Hokkaido, Japan

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We investigate if and how reasonable surficial densities can be obtained through the gravity-based inversion particularly in the Ishikari Plain, one of the major plains in Hokkaido, which as a whole consists of Quaternary sediments and volcanic deposits. More than 23,000 gravity data are successfully inverted for mapping the lateral density variation of the surface terrain above sea level in the Ishikari Region of western Hokkaido. No a priori condition is imposed in gravity data except that Bouguer anomaly distribution expressed by a third-order spline function is smooth relative to the topographic distribution. Density distributions are calculated based on the Akaike's Bayesian Information Criterion in which optimum trade-off parameters control the smoothness of Bouguer anomaly surface against its fitness to the observed gravity.

In general, the result shows that the estimated terrain density correlates well with major geologic units. The estimated densities are in a range 2.2-2.5 g/cm³ in the west mountainous area of the plain, where high gravity anomaly is dominant over the Neogene volcanic rocks. In most parts of the plain, however, the estimated terrain densities are rather small (1.7-2.2 g/cm³). In particular, considerably low density estimates are obtained in the southern part of the plain, where estimate errors are also unreasonable. In some regions the estimated densities show somewhat large deviations from the above general trend and tend to be unreasonably large (more than 3.0 g/cm³) or small (less than 1.5 g/cm³).