

Contribution of Airborne Gravity to Surface Gravity Recovery in Data-Sparse Regions: A Case Study over Taiwan

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High resolution surface gravity data is essential for precise geoid determination. In case of non-availability of dense gravity data, it is sometimes obtained either by interpolating using available terrestrial gravity data or filled-in data obtained using forward gravity modelling using DEMs, the latter being computationally expensive. Also, in some areas, terrestrial gravity observations may not have sufficient spatial coverage, especially in mountainous and complex regions. In such cases, sometime airborne gravity provides wider spatial coverage and may provide additional information where terrestrial gravity data are limited. This study investigates the contribution of airborne gravity to surface gravity recovery over Taiwan.

The airborne gravity data are processed using the Remove-Compute-Restore (RCR) approach to downward continue the airborne gravity anomalies from flight height to the terrestrial surface using Least-Squares Collocation (LSC), Inverse Poisson, and Gravity Gradient methods. The downward-continued airborne gravity is evaluated using independent terrestrial gravity observations, and the results are compared to select a method for further surface gravity recovery.

Surface gravity recovery is performed using (i)terrestrial gravity anomaly alone, (ii)downward-continued airborne gravity anomaly alone, and (iii)a combination of available terrestrial gravity anomaly and downward-continued airborne gravity anomaly. A part of the terrestrial gravity data is used in the analysis, while the remaining data are kept separately for independent validation. The recovered gravity is evaluated using statistical measure. The change in recovery error is compared for three cases: terrestrial gravity alone, downward-continued airborne gravity alone, and a combination of terrestrial and airborne gravity, to see how the recovery error changes when airborne gravity is added.

This study will help to understand how much additional information airborne gravity can provide for surface gravity recovery when terrestrial gravity observations are not sufficiently available under different terrain conditions.