

Effects of Linear and Quadratic Crossover Adjustments of Airborne Gravity Data on Local Geoid Determination: A Case Study in Central Thailand

Khetsophon Phinyo and Puttipol Dumrongchai*

¹ Department of Civil Engineering, Faculty of Engineering, Chiang Mai University, Thailand

*E-mail: puttipol.d@cmu.ac.th

Airborne gravity surveys extend spatial gravity coverage for local geoid determination. However, line-dependent systematic errors can produce discrepancies at flight-line crossovers and propagate into the resulting geoid. This study evaluates the effects of linear and quadratic crossover adjustments on local geoid determination using airborne gravity data acquired over central Thailand as part of the national survey. The correction parameters were estimated by constrained least squares, with truncated singular-value decomposition (TSVD) used to obtain a stable solution to the ill-posed problem arising from rank deficiency. Three airborne free-air anomaly datasets—unadjusted, linearly adjusted, and quadratically adjusted—were then processed using an identical computational procedure. Least-squares collocation was used for downward continuation of each airborne dataset from flight altitude before its integration with terrestrial gravity observations for geoid computation. The resulting geoid models were evaluated against GNSS/leveling-derived geoid heights within the study area. Both adjustment models improved internal crossover consistency, with the quadratic adjustment producing the lowest crossover root-mean-square. Among the evaluated solutions, the geoid computed from the quadratically adjusted data also performed best when compared with GNSS/leveling-derived geoid heights.