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Downward Continuation Methods of Airborne Gravity Data and Their Impacts on Local Geoid Modeling

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Four downward continuation methods, i.e. Least Square Collocation (LSC), the Inverse Poisson integral, Truncated Spherical Harmonic Analysis (tSHA), and Radial Basis functions (RBF), have been applied to the GRAV-D airborne gravity data in a joint study between NGS and NRCan. After removing the atmospheric effects and the systematic errors in the airborne data, these operators are used to downward continue the data from the actual flight heights (not the unrealistic so called mean flight level) onto the original surface gravity observation points (rather than grids) on the Earth's Surface in several different (in terms of the roughness of the terrain) areas that include Colorado region currently heavily focused by the IAG geoid working group. Some in-depth comparisons and discussions of these downward continuation methods will be given based on the results. Furthermore, the impacts of the downward continued airborne data on the geoid models are studied. Results show that the tSHA approach losses about 50% of the signal inherited in the airborne data when compared with the LSC and RBF resulted geoid models, while LSC approach causes an unknown bias. The inverse Poisson approach gives similar results but facing more numerical challenges, especially in the mountainous areas.