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Quantifying the contribution of airborne gravity data for geoid modeling: two case studies

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Airborne gravimetry has become increasingly important for geoid modeling because of its capability of collecting large scale gravity data over difficult areas. In order to quantify the contribution of airborne gravity data for geoid determination, two regions with distinct topographical condition, a hilly desert area in Mu Us of China and a mountainous region in Colorado of the USA were selected for gravimetric geoid modeling experiment. The gravimetric geoid model computed by combining satellite gravity model, terrestrial and airborne gravity data fits with GPS leveling data to 0.8 cm for Mu Us case and 5.3 cm for Colorado case. The contribution of airborne gravity data to the signal and accuracy improvement of the geoid was quantitatively evaluated for different spatial distribution and density of terrestrial gravity data. The results demonstrate that in the cases of the spacing of terrestrial gravity points exceeds 15 km, the additions of airborne gravity data improve the accuracies of gravimetric geoid models by 11.1%~48.3% for Mu Us case and 13%~20% for Colorado case.