Modelling Australian Gravimetric Quasi-Geoid with airborne gravimetry

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SUMMARY

Computing a geoid from gravity anomalies involves a series of "remove-predict-restore" operations. This process begins by removing global gravity and terrain effects, predicting the geoid, and then restoring these effects to obtain the final geoid model. Our study presents a comprehensive methodology for geoid computation across Australia, utilizing least squares collocation (LSC) for prediction. The LSC method involves two main stages. First, we generate a grid of gravity anomalies covering the region. These anomalies are derived from various sources, including terrestrial datasets, satellite altimetry, and airborne gravimetry and gradiometry campaigns. In the second stage, we use these gridded anomalies to calculate grid-based geoid heights. Our presentation focuses on the LSC computations specifically for New South Wales and Victoria. We emphasize the integration of diverse gravity data types—terrestrial, altimetry, airborne gravimetry, and airborne gradiometry. By adopting a combined approach, we produce a gridded quasi-geoid using LSC within the remove-predict-restore framework. This work provides valuable insights into the robust application of LSC for geoid determination. It demonstrates the efficacy of amalgamating different datasets to yield precise and comprehensive geoid models tailored to specific regions. The integration of airborne gravimetry and gradiometry data is particularly noteworthy, as it enhances the accuracy and resolution of the geoid model. In summary, our methodology showcases the potential of LSC in geoid computation, highlighting its ability to integrate multiple data sources effectively. This approach not only improves the accuracy of the geoid model but also ensures that it is well-suited to the Two-frame approach for height in Australia. Through this study, we aim to contribute to the ongoing efforts in Australian Gravimetric Quasi-Geoid modelling, providing a reliable and precise gravimetric quasi-geoid model for the Australian Vertical Working Surface.