Airborne gravimetry using a strapped-down LaCoste and Romberg S/A gravimeter: a feasibility study

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Abstract

Marine gravimeters mounted on stabilized platforms are commonly used in aircraft to perform airborne gravity measurements. The role of the stabilized platform is to level the sensor mechanically, whatever the aircraft attitude. However, this compensation is generally insufficient due to the sensitivity of modern gravity sensors. Correcting for off-level error requires that an off-level correction calculated from positioning data be added to gravimeter measurements, which complicates not only the processing, but also the assessment of precision and resolution.

This presentation show a feasibility study describing the leveling of a completely strapped-down LaCoste and Romberg gravimeter for airborne operations, by means of GPS positioning data. It focuses on the calculation of the sensor off-level correction needed for the complete gravity data processing. The precision of the off-level correction that can be achieved, in terms of GPS data precision and gravity wavelengths, is theoretically studied and estimated using the gravity and GPS data acquired during the Alpine Swiss French airborne survey.

While a 1 cm precision of GPS-determined baseline coordinates is sufficient to achieve a 5 mGal precision of the off-level correction, we maintain that this precision has to reach 1 mm to ensure a 1 mGal precision of the off-level correction at any wavelengths.

Without a stabilized platform, the onboard instrumentation becomes significantly lighter. Furthermore, the correction for the off-level error is straightforward and calculated from GPS data.

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