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GNSS Integrated Doppler Velocity Determination for GEOHALO Airborne Gravimetry

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The Global Navigation Satellite System (GNSS) plays a very important role in the field of airborne gravimetry. With the development of the airborne gravimetry, the traditional velocity determination of Global Positioning System (GPS) signal system is facing new challenges. On one hand, the novel airborne gravimetric project, such as GEOHALO on the German High Altitude and Long Rang Research Aircraft HALO, which is characterized by its high-altitude, long-range and high-dynamics, requires more accurate and reliable GNSS-based state information for the kinematic platform than before in traditional airborne gravimetry, and on the other hand, the rapid development of multiple GNSS systems (GPS, GLONASS, BDS, Galileo, etc.) provides more information and new opportunities for improving the accuracy and reliability of the GNSS results for kinematic platforms. In order to fulfil the requirements of more accurate and reliable GNSS-based state information for kinematic platform of the novel airborne gravimetry, a strategy of GNSS integrated (GPS and GLONASS) Doppler velocity determination based on robust estimation and Helmert's Variance Components Estimation (VCE) is proposed in this study. To test this strategy, the GNSS Doppler data of HALO aircraft have been processed and its obtained velocity results have been applied in GEOHALO airborne gravimetry. The results shown that the proposed strategy can improve the accuracy of GNSS Doppler velocity determination and fulfil the requirements of new GEOHALO airborne gravimetry.