

Results from Strapdown Airborne Gravimetry Test in Turkey

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In March 2017, three flight tests were undertaken by General Command of Mapping within the Turkish Height System Modernization and Gravity Recovery Project to assess the performance of iNAV-RQH-1001 strapdown inertial navigation system of iMAR Navigation GmbH for airborne gravimetry and geoid mapping. The tests took place in Turkey over a 110 km x 100 km area covered by highly dense ground truth data. The flights were carried out with Beechcraft B200 equipped with a TRIMBLE AV37 GNSS antenna. 11 N-S and 12 E-W profiles with nearly 10-km line spacing were flown with an average ground speed of 100 m/s and average altitude of 3000 m above sea level. A simple thermal calibration was applied to the vertical Z-accelerometer, based on a laboratory calibration done in March 2017 at the iMAR calibration facilities. Loosely coupled INS/GNSS integration architecture with closed-loop correction was implemented in the processing. The data was processed using 18 state Extended-Kalman filter (EKF), with additional 6 auxiliary states for the time-derivatives of the gravity disturbances as required by the third-order Gauss-Markov model for the gravity disturbance. After the execution of the EKF, a Rauch-Tung-Striebel-Smoother (RTS) was applied to the EKF estimates. Internal consistency and precision of the gravity measurements were evaluated at 108 cross-over points and two E-W repeated lines. The non-adjusted and adjusted (constant bias per line) RMSE statistics at cross-over points was found 1.9 mGal and 0.77, respectively. Fairly good agreements were obtained between repeated lines with 0.55 mGal RMSE for Line-1 and 0.64 mGal RMSE for Line-2 after shifting the results of both lines to a zero-mean. The external accuracy was evaluated by comparing the ground truth gravity data with downward continued airborne gravity values using a detailed terrain model. The RMSE of the difference between downward continued airborne and terrestrial data was found about 3 mGal.