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Modelling airborne gravity data by means of adapted Space-Wise approach

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Regional gravity field modelling by means of remove - restore procedure is nowadays widely applied to predict grids of gravity anomalies (Bouguer, free-air, isostatic, etc.) in gravimetric geoid determination as well as in exploration geophysics.
Considering this last application, due to the required accuracy and resolution, airborne gravity observations are generally adopted. However due to the relatively high acquisition velocity, presence of atmospheric turbulence, aircraft vibration, instrumental drift, etc. airborne data are contaminated by a very high observation error. For this reason, a proper procedure to filter the raw observations both in the low and high frequency should be applied to recover valuable information.
In this work, a procedure to predict a grid or a set of filtered along track gravity anomalies, by merging GGM and airborne dataset, is presented. The proposed algorithm, like the Space-Wise approach developed by Politecnico di Milano in the framework of GOCE data analysis, is based on a combination of along track Wiener filter and Least Squares Collocation adjustment and properly considers the different altitudes of the gravity observations.
Among the main differences with respect to the satellite application of the Space-Wise approach there is the fact that, while in processing GOCE data the stochastic characteristics of the observation error can be considered a-priori well known, in airborne gravimetry, due to the complex environment in which the observations are acquired, these characteristics are unknown and should be retrieved from the dataset itself.
Some innovative theoretical aspects focusing in particular on the theoretical covariance modelling are presented too. In the end, the goodness of the procedure is evaluated by means of a test on real data recovering the gravitational signal with a predicted accuracy of about 0.25 mGal.