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Optimal choice of the analytical covariance model for validating gravity data sets with an example in the north part of Algeria

S. A. Benahmed Daho (1), C. Sahel (1)

(1) National Centre of Spatial Techniques, Geodetic Laboratory - BP 13 Arzew - 31200 - Algeria. E-mail: d_benahmed@hotmaiI.com /Fax: +213-4147-3665

The validation is an extremely strict procedure that guarantees quality and integrity of the gravity data bank. These are generally the type of data used in the modelling of local gravity fields. It is applied systematically to all sets of data before being integrated into the data bank. The principle consists of comparing the observed value and the predicted one estimated by a powerful technique like Collocation method. But the difficult step in the application of the collocation technique is the determination of the empirical covariance function and subsequently the selection of its corresponding analytic representation capable to describe the local behaviour of the gravity field. The main goal of this paper is to propose a procedure for the selection of the optimal analytical covariance model for the validation purposes. Several local analytical covariance functions broadly used in physical geodesy were tested and the most suitable will be selected in test area from a statistical procedure. For this purpose, the gravity data provided by the B.G.I., consisting of 2206 gravity measurements covering the north part of Algeria between the limits [34°, 37°] in latitude; and [0°, 8°] in longitude, and the tailored geopotential model OSU91A complete to degree and order 360, have been used to test the developed methodology. The validation has been applied systematically to predict free-air gravity anomalies reduced from the effect of the spherical harmonic coefficient set OSU91A. The error ration detected using this technique represent 1.96% which remains high with regard to the number of measures used. This work shows the non-homogeneity of the gravity data in experimental area and their insufficient accuracy. The Algerian gravity network status, the data used in this study and their distribution, the computation procedure, the different numerical tests, some conclusions and recommendations will be presented and widely discussed.

Key words: Collocation technique, Geopotential model, and validation procedure.