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Assessments on GOCE-based Gravity Field Model Comparisons with Terrestrial Data Using Wavelet Decomposition and Spectral Enhancement Approaches

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The recent Earth gravity field satellite missions data lead significant improvement in Global Geopotential Models in terms of both accuracy and resolution. However the improvement in accuracy is not the same everywhere in the Earth and therefore quantifying the level of improvement locally is necessary using the independent data. The validations of the level-3 products from the gravity field satellite missions, independently from the estimation procedures of these products, are possible using various arbitrary data sets, as such the terrestrial gravity observations, astrogeodetic vertical deflections, GPS/leveling data, the stationary sea surface topography. Quantifying the quality of the gravity field functionals via recent products has significant importance for determination of the regional geoid modeling, base on the satellite and terrestrial data fusion with an optimal algorithm, beside the statistical reporting the improvement rates depending on spatial location. In the validations, the errors and the systematic differences between the data and varying spectral content of the compared signals should be considered in order to have comparable results. In this manner this study compares the performance of Wavelet decomposition and spectral enhancement techniques in validation of the GOCE/GRACE based Earth gravity field models using GPS/leveling and terrestrial gravity data in Turkey. The terrestrial validation data are filtered using Wavelet decomposition technique and the numerical results from varying levels of decomposition are compared with the results which are derived using the spectral enhancement approach with contribution of an ultra-high resolution Earth gravity field model. The tests include the GO-DIR-R5, GO-TIM-R5, GOCO05S, EIGEN-6C4 and EGM2008 global models. The conclusion discuss the superiority and drawbacks of both concepts as well as reporting the performance of tested gravity field models with an estimate of their contribution to modeling the geoid in Turkish territory.