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Geoid determination with the Remove-Restore method

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The research aims at determination of the geoid undulation with the Remove-Restore method. Two approaches were realized – Stokes approach with three variants of Stokes' kernel function (planar, approximated spherical, rigorous spherical) and Koch approach with Hotine's kernel function. The main difference between these approaches beside the kernel function is input data – gravimetric anomalies and gravimetric disturbances respectively.
The research is devoted to comparison of Stokes and Koch approaches in the geoid determination and testing their changes due to different initial parameters of the chosen geopotential model e.g. maximum degree. However, influence of Stokes' kernel function and influence of data used for the chosen global gravity field model on the geoid undulation were also studied. Detailed analysis was performed, accounting outcomes received in each step of the Remove-Restore method as well as their influence on the results of the geoid undulation. Calculations and analysis were realized in own program developed in Matlab software environment. It was validated with other programs devoted to the geoid determination including FFTGEOID developed by Yecai Li and Michael Sideris. The research was performed for area of Poland, with usage of digital terrain model ETOPO1, gravimetric anomalies from WGM2012 model and several geopotential models shared by International Centre for Global Earth Models e.g. EGM2008.
Performed calculations allow to draw conclusions on Stokes and Koch approaches for the geoid determination as well as they allow to define nominal characteristics of the geopotential models for usage in the Remove-Restore method. Both approaches give similar results considering the mean difference of 5 – 7 cm, depend on initial parameters. It was proven that maximum degree and source data of the geopotential models influence the outcomes of the geoid undulation. The most accurate and least time consuming results were obtained for EGM2008 and EIGEN-6C4 models for 720 degrees.