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Comparison of gravimetric quasigeoid models using spherical Stokes's function and its five deterministic modifications

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The evaluation of Stokes's surface integral over the sphere in the determination of the geoid/quasigeoid, representing the analytical solution of the third geodetic boundary value problem in spherical approximation, must usually be restricted due to lack of gravity data. Therefore, in practice small integration radius around each computation point is considered according to availability of gravity data using a remove-compute-restore procedure when original Stokes's integral is divided in both, frequency and space domain. The higher-frequency effect of the rest of gravity data beyond the integration radius is known as a truncation error and can be minimized with the modification of Stokes's function.

The original Stokes function and its five deterministic modifications have been used in this study for computation of gravimetric quasigeoid model in Slovakia based on real gravity data. The integration radii ψ_0=1°, 2°, 3° have been applied for every modification. The two choices of maximal degrees of low-frequency part of the gravity field n=20 and n=360 have been used for majority of modification. Comparison with the existing GPS/leveling points has been performed. Finally, a discussion about similarities and differences of our results with those of former studies, usually made on synthetic data, concludes our contribution.