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The novel scheme for solving oblique derivative boundary-value problem

Marek Macák, Karol Mikula, and Zuzana Minarechová

Slovak University of Technology in Bratislava, Department of Mathematics and Descriptive Geometry, Bratislava, Slovakia (m.macak@gmail.com)

Our aim is to present the novel scheme for solving oblique derivative boundary-value problem (BVP) by the finite volume method (FVM) in 2D and 3D domains. Opposite to the previous finite element's and finite volume's approaches, in this presentation we decompose the oblique derivative into its normal and tangential components and test FVM by using such approach. We solve the oblique derivative BVP in circular and spherical domains and we show that experimental order of convergence of the developed algorithms is equal to 2. Then we apply this algorithm to solving the fixed gravimetric BVP, namely, the numerical solution is sought in 3D computational domain above the Earth bounded by the chosen part of the Earth's surface – area of Slovakia, corresponding upper spherical boundary and four additional side boundaries. On the upper spherical and side boundaries the Dirichlet boundary conditions (BC) are generated from GOCE_DIR2 satellite geopotential model up to degree 240. On the Earth's surface, the oblique derivative BC in the form of surface gravity disturbances obtained from discrete terrestrial gravimetric measurements is applied. The disturbing potential as a direct numerical result is transformed to the quasigeoidal heights and compared with GPS-levelling data.