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Nonlinear diffusion filtering of the GOCE-based satellite-only MDT

Róbert Čunderlík and Karol Mikula

Slovak University of Technology, Faculty of Civil Engineering, Dept. of Mathematics, Bratislava, Slovakia (cunderli@svf.stuba.sk)

A combination of the GRACE/GOCE-based geoid models and mean sea surface models provided by satellite altimetry allows modelling of the satellite-only mean dynamic topography (MDT). Such MDT models are significantly affected by a stripping noise due to omission errors of the spherical harmonics approach. Appropriate filtering of this kind of noise is crucial in obtaining reliable results. In our study we use the nonlinear diffusion filtering based on a numerical solution to the nonlinear diffusion equation on closed surfaces (e.g. on a sphere, ellipsoid or the discretized Earth's surface), namely the regularized surface Perona-Malik model. A key idea is that the diffusivity coefficient depends on an edge detector. It allows effectively reduce the noise while preserve important gradients in filtered data. Numerical experiments present nonlinear filtering of the satellite-only MDT obtained as a combination of the DTU13 mean sea surface model and GO_CONS_GCF_2_DIR_R5 geopotential model. They emphasize an adaptive smoothing effect as a principal advantage of the nonlinear diffusion filtering. Consequently, the derived velocities of the ocean geostrophic surface currents contain stronger signal.