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Nonlinear diffusion filtering influenced by mean curvature

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The presentation introduces a new nonlinear diffusion filtering method on closed surfaces such as a sphere, ellipsoid or the Earth's surface. Our new model extends the regularized surface Perona-Malik model by including a local extrema detector based on a mean curvature of processed data. The model is thus represented by a nonlinear diffusion equation which filters noise while preserves main edges, local extrema and details important for a correct interpretation of data. We define a surface finite-volume method to approximate numerically the nonlinear parabolic partial differential equation on a closed surface. The closed surface is approximated by a polyhedral surface created by planar triangles representing subdivision of an initial icosahedron grid and we use a piece-wise linear approximation of a solution in space and the backward Euler time discretization. Numerical experiments present nonlinear diffusion filtering of artificial data and real measurements, namely the GOCE satellite observations. They aim to point out a main advantage of the new nonlinear model which, on the contrary of Perona-Malik model, preserves local extremal values of filtered data.