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Automatic channel network extraction from lidar through nonlinear diffusion and geodesic paths

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An advanced methodology for channel network extraction is developed and implemented on several high resolution data sets of different characteristics, from a steep and landslide-dissected basin, to a mountainous region, to a flat and partly artificially drained area. The methodology incorporates nonlinear diffusion for the pre-processing of the data, both to focus the analysis on the scales of interest and to enhance features that are critical to the channel extraction. Following this pre-processing, channels are defined as curves of minimal effort, or geodesics, where the effort is measured based on fundamental geomorphological characteristics such as flow accumulation and iso-height contours curvature.
The results obtained show that the geometric nonlinear methodology is computationally efficient and able to achieve robust extraction of the channels.