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Channel network identification from high-resolution DTM: a statistical approach.

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A statistical approach to LiDAR derived topographic attributes for the automatic extraction of channel network is presented in this work. The core idea of the proposed methodology is to use statistical descriptors to objectively identify channel where terrain geometry denotes significant convergences. Terrain geometry representation relies on LiDAR Digital Terrain Models (DTMs) with 1m grid resolution. Surface convergences are highlighted using topographic attribute maps (curvature and openness) derived from the DTMs using different window sizes. The choice of the optimum kernel size relies on a statistical analysis on topographic attributes values distributions. The extraction procedure is a three-step method based (a) on the normalization and overlapping of openness and minimum curvature in order to highlight the more likely surface convergences, (b) a weighting of the upslope area according to such normalized maps to identify drainage flow paths and flow accumulation consistent with terrain geometry, and (c) the use of a value derived from the z-score normalization of the weighted upslope area as non-subjective threshold for channel network identification. For optimal definition and representation of a meaningful and fully connected network, a noise-filtering and connection procedure is applied as a final step. The advantage of the proposed methodology, and its accuracy on localizing the investigated features are demonstrated comparing the final extraction with field surveyed networks.