Geophysical Research Abstracts
Vol. 13, EGU2011-8286, 2011
EGU General Assembly 2011

Derivation of channel network of an alpine region from high-resolution DTM: the example of the Autonomous Province of Trento (Italy)

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The availability of high-resolution digital terrain models (HR-DTMs) of regional coverage opens interesting prospects for the analysis and management of landscape. These terrain models offer an unprecedented capability to interpret surface morphology and the related geomorphic and hydrological processes. Moreover, the availability of regional HR-DTMs is increasing, thanks to technological developments and decreasing costs of data acquisition and processing. An important issue in landscape analysis is the definition of the channel network. The mapping of the channel network plays a fundamental role in different landscape management issues, such as technical cartography, water resources management, geo-hydrological risk analysis, and legal matters related to land use. We present our experience in the derivation of channel network from regional HR-DTM for an alpine region (Autonomous Province of Trento, Northern Italy), covering an area of 6500 km2. For this region a HR-DTM (cell size of 2 m), derived from an airborne LiDAR survey, is available. Initially, we tested different morphological algorithms for extracting the channel network from the HR-DTM: a curvature-based and a modified slope-area approach. Both approaches generate suitable results in terms of drainage density and channel heads location, but the curvature-based algorithm was preferred for its better performance in low-slope areas. However, the automatically derived channel network represents a raw hydrographic network that needs a supervised control analysis. The check and correction procedure was carried out by means of interpretation of high-resolution orthophoto imagery (panchromatic and near-infrared, pixel size 0.5 m), geomorphometric indexes derived from the HR-DTM (shaded relief, openness, local anomalies, curvature, etc.), technical cartography (1:10000 and 1:25000 scale) and field surveys.