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Geomorphometric analysis of fine-scale morphology for extensive areas: a new surface-texture operator

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The application of geomorphometric analysis to high resolution digital terrain models (HRDTM) amplifies our capability to characterize and interpret fine-scale solid earth surface morphology. In this context it is possible to analyze fine-scale morphology in term of surface texture (e.g. Trevisani, 2012; Lucieer, 2005) and retrieve information linked to the different geomorphic processes and factors; this kind of analysis has an interesting potential to be exploited in the context of quantitative geomorphologic/geologic interpretation and geo-engineering. We developed a multiscale texture operator capable to synthetize the main characteristics of local surface texture in an efficient way. The proposed operator can be viewed as an hybrid between classical geostatistical spatial continuity indexes (e.g. variogram, Atkinson, 2000) and the well-known operator based on (rotation invariant) local binary patterns (Ojala, 2002). An important characteristic of the operator is to derive information on surface texture in an easily interpretable form so as to facilitate its use by experts for the interpretation of geomorphic processes and factors. Moreover this surface texture operator could be used for the derivation of more complex and ad-hoc surface texture indexes. We present the application of the operator in the analysis of different HRDTMs, mainly in the context of alpine environment. A particular interesting example is the application of the surface texture analysis in an extensive area (hundreds of km2), including also urbanized zones, and the evaluation of potential links between surface texture and lithological and geo-structural factors.

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