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Hydro-geomorphic connectivity and landslide features extraction to identifying potential threats and hazardous areas

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Hydro-geomorphic connectivity has significantly emerged as a new concept to understand the transfer of surface water and sediment through landscapes. A further scientific challenge is determining how the concept can be used to enable sustainable land and water management. This research proposes an interesting approach to integrating remote sensing techniques, connectivity theory, and geomorphometry based on high-resolution digital terrain model (HR-DTMs) to automatically extract landslides crowns and gully erosion, to determine the different rate of connectivity among the main extracted features and the river network, and thus determine a possible categorization of hazardous areas.
The study takes place in two mountainous regions in the Wellington Region (New Zealand). The methodology is a three step approach. Firstly, we performed an automatic detection of the likely landslides crowns through the use of thresholds obtained by the statistical analysis of the variability of landform curvature. After that, the research considered the Connectivity Index to analyse how a complex and rugged topography induces large variations in erosion and sediment delivery in the two catchments. Lastly, the two methods have been integrated to create a unique procedure able to classify the different rate of connectivity among the main features and the river network and thus identifying potential threats and hazardous areas. The methodology is fast, and it can produce a detailed and updated inventory map that could be a key tool for erosional and sediment delivery hazard mitigation. This fast and simple method can be a useful tool to manage emergencies giving priorities to more failure-prone zones. Furthermore, it could be considered to do a preliminary interpretations of geomorphological phenomena and more in general, it could be the base to develop inventory maps.

References

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