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Clustering sediment connectivity maps to characterize surface morphologies in mountain catchments

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In mountain environments the mutual interaction between structural elements and surface processes is one of the major driver of landscape evolution. Surface morphology, as a result of this interaction, carries important information to characterize the active structure-process mutual dynamics. For this reason, it is important to derive as much information as possible from surface analysis techniques. In the present work, we apply a clustering technique to analyze the information embedded in a geomorphometric indicator. We consider a sediment connectivity index and its spatial distribution, to seek for homogeneous morphodynamics units. The selected index carries DTM-related information on slope, flow paths (flow directions, drainage area, flow path length) and surface roughness, thus being a good candidate to sum up surface morphologies information. Furthermore, considering the connectivity index spatial distribution in the clustering technique allows for the selection of contiguous and similarly behaving areas.
The effectiveness of the approach is analyzed in selected alpine areas featuring a wide spectrum of both morphological features and active processes. Field surveys have confirmed the usefulness of the resulting clusters, which have proved capable of detecting consistent morphodynamics units within the catchment. The proposed method arranges for valuable information that can be exploited to set and optimize priorities of intervention and landscape management. The clusters are proposed as a tool to better depict the catchment spatial organization, highlighting those consistent morphological units that behave similarly. In this way, the presented approach is meant to facilitate landscape zonation and prioritization for an improved sediment management and environmental planning.