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Object-oriented geomorphological mapping model for landslide systems analysis.

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Spatio-temporal relations between landslide occurrences are a key concept for landslides hazard evaluation. A symbol-based 2D mapping approach usually cannot store such complexity, especially in areas where the events succession is characterized by the superimposition of different landslide types, probably related to several triggering factors, therefore different recurrence time.

The proposed object-oriented mapping approach allow to maintain the spatial integrity of the dataset, not only in the 2D space but also in the 3D space preserving vertical relations between overlapping objects or object components, an extremely common occurrence dealing with landslides, which is crucial for the correct implementation of topological models such as the Dimensionally Extended nine-Intersection Model (DE-9IM) and the Region Connection Calculus (RCC8).

Treating landslides as objects lead to the introduction of landslide hierarchies. In this work the focal classes are represented by the landslides themselves, differentiated by types, which result from the aggregation of their components, such as detachment areas, main bodies or debris and so on. Further generalization or aggregation of the focal classes objects produces two orders of super-classes: i) “landslide complexes”, differentiated by type, containing all the landslides of the same type with at least a “partially overlapping” topological relation, assumed as “functional interaction”; ii) “landslide system”, defined as the aggregation of interacting “landslide complexes”.

In this framework every object is related to a specific event, meaning that its structure is designed for the implementation of temporal data, both absolute (when available) and relative. Temporal analysis allows the transition from an object-oriented to an event-based mapping approach in a 4D time-space framework.