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# FORMATION - Full cOveRage, Multi-scAle and multi-sensor geomorphological map: a practical tool for TerrItOrial planning and landslide analysis

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The FORMATION project aims at fostering the implementation of new approaches for the description of geomorphological processes and representation of landforms, whose spatial distribution represents the most immediate tool to detect areas affected by geological risks, such as landslides.

The FORMATION project aims to fill this gap, integrating emerging remote sensing techniques into the new Italian guidelines for the geomorphological mapping provided by ISPRA (*Istituto Superiore per la Protezione e la Ricerca Ambientale* in Italian, Italian Institute for the environmental protection and research). The main driver of the FORMATION project is the design of new paradigms for geomorphological mapping, where outcomes of traditional geomorphological survey and land degradation models, coupled with multi-band satellite analysis and multi-platform LiDAR and UAV data are convoyed within GIS (Geographic Information System) environment for the classification of landforms and the creation of a multi-scale, digital geomorphological map.

Databases, models, tools and methods will be presented and discussed with prototype implementations at pilot Italian cases in the Alps and Apennines, which share common pressing challenges on the environment, such as gravitational and running water-based processes causing several damages with a direct implication on human life and millions of euros spent in environmental remediation. Target basins have been selected to cover different geological, geomorphological and climatic settings and to demonstrate the effectiveness and replicability of the proposed methodology.

Here we present preliminary results for the Val d'Orcia, an area in Central Tuscany (Italy) with a long history of landslides and erosive processes. We exploited outputs provided by interferometric processing of Sentinel-1 data to create ground deformation maps used to scan wide areas, flag unstable zones and support the definition of priorities starting from the situations deemed to be most urgent. A database of active moving areas has been created to support further activities of the project, including field surveys, further investigation with landscape investigations and modeling.

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