6th WORLD LANDSLIDE FORUM
2023 FLORENCE ITALY

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LANDSLIDE SCIENCE FOR SUSTAINABLE DEVELOPMENT

Proceedings of the 6th World Landslide Forum.
Florence Italy, 14-17 November 2023
Abstract book

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SESSION 1.3

CASCADING MULTI-HAZARD RISKS: SUBMARINE LANDSLIDES, TSUNAMIS, AND IMPACTS ON INFRASTRUCTURES (part I)

REGIONAL INVENTORIES OF DEEP-SEATED GRAVITATIONAL SLOPE DEFORMATIONS: FOCUS ON THE CENTRAL APENNINES

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Purpose: The Deep-Seated Gravitational Slope Deformations (DSGSDs) are large-sized, slow-moving, long-lasting processes that may induce severe rock mass deformation. DSGSDs have been recognized worldwide, including the tectonically active Apennines belt. Despite the several DSGSDs identified so far, we still lack a complete inventory of Apennines cases. While a first inventory was set in the Molise region (Discenza et al., 2023), our work focuses on the Abruzzi region, encompassing the central portion of the Apennines belt. Their distribution can provide hints on the dependence on predisposing (i.e., geostructural setting) or preparatory/triggering (e.g. seismicity or climatic forcing) conditions. The detection of DSGDs in a tectonically active environment (Moro et al., 2012) has also geohazard-related implications, due to their potential to predispose to localized catastrophic failures or earthquake ground motion amplification in damaged rock masses.

Methods: DSGSDs were detected and mapped through remote sensing (analysis and interpretation of stereoscopic aerial photos) combined with field surveys. Records in the geodatabase are reported as polygons (outline of the deforming slope areas) along with information on their kinematic characteristics (type of movement and state of activity), morphometric parameters (area, mean slope, relief energy, etc.) and geological scenarios (Neogene folds or thrusts, Quaternary normal or strike-slip faults), obtained by overlay analyses in a GIS environment.

Results: Our results show a heterogenous distribution of the about 100 detected DSGSDs. Significant lateral spreading processes are concentrated along main thrust fronts, where thick and rigid carbonate sequences lie on on less rigid lithologies (e.g., flysch). Sackung-type deformation is instead frequent along the back-limbs of the main anticline structures or along active fault traces.

Conclusions: In general, even today the most effective methodology for the identification and characterization of DSGSDs turns out to be the synoptic view of the landscape by photointerpretation of characteristic geomorphological indicators (such as double ridges, trenches, and counter-slope scarps); using stereoscopic aerial photos and stereoscopes the error associated with the photo-identification process can be estimated at 15 percent. Field surveys allowed us to validate and refine the remotely-sensed inventories. Although the research must be improved through more accurate analyses in a hazard-oriented perspective, we may draw some preliminary remarks. The distribution of DSGSDs highlights the predisposing role of geological structures inherited from the Apennines build-up, as well as of the present topographic setting, and the preparatory effect of fluvial dynamics following the post-Middle Pleistocene regional uplift of the region. Conversely, the role of earthquake activity and active faulting, which are generally considered potential triggering elements, is definitely more arguable.

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