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Seeking seismogenic sources for paleoearthquakes in the Alps: clues from a DSGSD in the Italian Southern Alps.

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Triggering mechanisms and causative processes of deep-seated gravitational slope deformations (DSGSD) in Alpine and high mountain areas include among others post-glacial debudding, earthquake-induced ground shaking or co-seismic surface faulting. Distinguishing between climatic or tectonically driven factors is challenging since faults and fracture systems can play both an active and/or passive role in the process initiation. We applied an integrated approach, including morpho-structural analysis, geologic field survey, a paleoseismological approach based on radiocarbon dating and detailed sedimentological analysis, to a DSGSD located in the Cavargna Valley (N Italy), an area that was never occupied by extensive ice cover in the Upper Pleistocene and Holocene.

We attempted to identify the triggering mechanism for the Cavargna Valley DSGSD by considering the historical earthquake catalog, a dataset of offshore lacustrine paleoseismological indicators and regional flood chronology.

We conclude that a seismic triggering is likely for the onset of the DSGSD during the initial Middle Holocene, based on the spatio-temporal clustering of offshore evidence, with a possible source located in an area lacking known historical seismicity or active faults, pointing to a possible knowledge gap in the seismotectonics of the Alps. Later evolution and successive pulses in the activity of the Cavargna Valley DSGSD (Late Holocene), instead, seem to be correlated to regional proxies of climatic changes, showing a possible association with periods of increased surface instability.

Keywords: seismic landslides, DSGSD, triggering factors, European Alps

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