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Landslides and fortified settlements as valuable geoheritage sites in the Moldavian Plateau, North-Eastern Romania

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Landslides are widespread natural phenomena that shape the earth surface. As such, they are part of the environment where people live, playing an important role as natural hazard, but also making a place peculiar for its specific morphology. Nowadays, like in the past, people living in hilly to mountainous areas have always had to face landslides.
In the Eastern Carpathians lowlands, landslides have carved a landscape with inaccessible escarpments tens of meters high, providing old populations with panoramic and naturally defensive places to build their settlements. This interaction produced an association of landslide morphologies and archaeological remains that is unique in Romaina.
In this study, we present the case of chalcolitic and thraco-getic (6.5 ka BP to 500 BP) fortified settlements, for which landslides provided a favorable place for their construction on one hand, and acted as a natural hazard on the other hand. In the Moldavian Plateau, North-Eastern Romania, more than 50 sites were identified on structural plateaus bounded by wide scarps of Pleistocene landslides, on cuesta ridges bounded by scarps of Holocene landslides, or situated on hillslopes, on erosional remnants of landslide bodies. For nine out of the 50 sites, we produced accurate geomorphological landslide inventories, mapping more than 500 landslides starting from high resolution LiDAR DEM derived images. Such inventories provide information on landslide type and relative ages (very old, old, recent landslides) based on the morphological appearance of each slope failure.
Analysis of the relations between the sites hosting the fortified settlements, their archaeological remains and very old landslides distribution, provides evidences that landslide scarps and their deposits were used by these populations as defensive sites. In particular, the scarps were used as natural walls, allowing to save material and manpower required to erect walls on the gentle and open parts of the sites. Besides, in places, layered paleosoils are visible on stacked old and very old landslide deposits, which witnesses a very complex and dynamic geomorphological history, worth of scientific interest.
Furthermore, evidences show also that the retrogressive reactivation of some relict and old slope failures partially destroyed some fortresses, being a natural hazard for the inhabitants at the time of landslide occurrence, but also threatening what nowadays is to be considered a series of valuable geosites. This situation requires a detailed analysis of landslide hazard and risk for these sites, especially considering possible protection measures and actions to preserve the geoheritage of this area of Romania.
We finally propose an itinerary trough the most representative sites, providing both, panoramic and detailed views of the geomorphology and archaeology of these sites.