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Landslide and Rockfall failures Characterization with Object-Based 3D Analysis

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Geological failures from massive rockfall failures to small landslides of few cubic meters are a major geological hazard in many parts of the world. Based on the latest developments, close-range photogrammetry and individually UAV photogrammetry and Light Detection and Ranging systems have become indispensable tools for geo-experts in order to provide ultra high-resolution 3D models of the failure site. TLS suffers from the fact that is sometimes tricky to capture the holistic area of interest from the ground, while some areas may often be obscured by vegetation or negative inclinations. The science of photogrammetry has long been used to accurately detect and characterize landslide and rockfall failures. Due to the continuously increasing spatial resolution capability of new generation sensors, traditional pixel-based approaches are not capable to cope with the level of detail resulted from those sensors. Mostly, landslides present complex and dynamic geomorphological features with great heterogeneity in their spatial, spectral and contextual properties dependent on the specific failure mechanism. In the current study, an object-based 3D approach for the automated detection of landslide and rockfall hazard is presented based on detailed topographic photogrammetric point clouds and 3D analysis. Recent trends show that close photogrammetry will play a vital role on the geological and engineering geological assessments concerning geo-failures. The results show that object-based approach is closer to human interception due to integration of contextual and semantic, spectral and spatial information rather than translating pixel's spectral information solely. The current procedure provides a detailed objective quantification of landslide characteristics and automated semantic landslide modelling of the case site.