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Comparison of 3D point clouds obtained by photogrammetric UAVs and TLS to determine the attitude of dolerite outcrops discontinuities.

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Photogrammetric Unmanned Aerial Vehicles (UAVs) and Terrestrial Laser Scanners (TLS) are two emerging technologies that allows the production of dense 3D point clouds of the sensed topographic surfaces. Although image-based stereo-photogrammetric point clouds could not, in general, compete on geometric quality over TLS point clouds, fully automated mapping solutions based on ultra-light UAVs (or drones) have recently become commercially available at very reasonable accuracy and cost for engineering and geological applications.

The purpose of this paper is to compare the two point clouds generated by these two technologies, in order to automatize the manual process tasks commonly used to detect and represent the attitude of discontinuities (Stereographic projection: Schmidt net – Equal area).

To avoid the difficulties of access and guarantee the data survey security conditions, this fundamental step in all geological/geotechnical studies, applied to the extractive industry and engineering works, has to be replaced by a more expeditious and reliable methodology.

This methodology will allow, in a more actuated clear way, give answers to the needs of evaluation of rock masses, by mapping the structures present, which will reduce considerably the associated risks (investment, structures dimensioning, security, etc.).

A case study of a dolerite outcrop locate in the center of Portugal (the dolerite outcrop is situated in the volcanic complex of Serra de Todo-o-Mundo, Casais Gaiola, intruded in Jurassic sandstones) will be used to assess this methodology. The results obtained show that the 3D point cloud produced by the Photogrammetric UAV platform has the appropriate geometric quality for extracting the parameters that define the discontinuities of the dolerite outcrops. Although, they are comparable to the manual extracted parameters, their quality is inferior to parameters extracted from the TLS point cloud.