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Rock slope stability analysis of fractured rhyolite tuff: joint system detection with remote sensing techniques, ShapeMetrix and kinematic analysis

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Rock slope stability analysis requires the precise documentation of joint system besides understanding material parameters. The present study compares the results of four different methods of joint mapping by using an example from Hungary and it links these with rock slope stability analysis. The study area is located in southern central Hungary (Sárbogárd quarry), where silicified rhyolite tuff is exploited. The quarry face exposes the densely fractured rock wall, which are prone to rock falls. To assess the slope stability a combination of techniques were applied. A conventional filed survey method and three remote sensing techniques (TLS, UAV and photo documentation) were used to obtain data from the 120m-long part of the rock slope. Fracture and joint system was also measured manually. After processing obtained data with software of Agisoft PhotoScan, CloudCompare, DSE, SMRT and ShapeMetriX the dip directions and orientation of the discontinuities were compared. Joint spacing was also calculated. The comparison of joint system data obtained by these techniques also forms an important part of this study. Slope stability was calculated using obtained slope geometries, rock mechanical data of laboratory tests. Dips 7.0 software was applied for kinematic analysis, RocPlane 3.0 for planar wedge stability and Swedge 6.0 for surface wedge stability analysis. The analyses revealed that detailed photographic documentation of accessible cliff faces can provide high resolution data that is comparable with the data obtained by TLS or UAV.