DISCONTINUITY ANALYSES USING METHODICALLY DIFFERENT IN-SITU AND REMOTE SENSING MEASUREMENTS (SIMMERING/HAIMING CASE STUDY, TYROL)

PRAGER, Christoph* (1,2); FEY, Christine (1,3); PERZLMAIER, Sebastian (3); STRAUHAL, Thomas (1); WICHMANN, Volker (1)

1: alpS GmbH, Grabenweg 68, 6020 Innsbruck; 2: ILF Consulting Engineers Austria GmbH, Feldkreuzstrasse 3, 6063 Rum/Innsbruck; 3: TIWAG – Tiroler Wasserkraft AG, Eduard-Wallnöfer-Platz 2, 6020 Innsbruck

prager@alps-gmbh.com

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Systematic discontinuity analyses are required to assess the rock-mechanical and hydrogeological properties of fractured rock slopes. Therefore, methodically different in-situ and remote-sensing measurements were applied for the investigation of a steep and rugged slope (Simmering/Haiming, Inn-Valley). The investigated slope is made up of obscurely bedded to massive dolostones, limestones and breccias in reef-facies (Wetterstein-Fm., M-Triassic). These steeply SE-dipping strata are overprinted by mainly NE-SW- and NW-SE-trending fault- and fracture-systems, and, in a regional tectonic context, to be attributed to the Inntal nappe unit.

For discontinuity analyses and fabric assessments, here surface field measurements were performed in the form of non-systematic spot-measurements and systematic scanlines in accessible areas (at the base of sub-vertical rock faces). Along the scanlines, for every discontinuity plane, a variety of geotechnical parameters were recorded (according to national standards and ISRM guidelines) for statistical analyses.

In addition to these manual surface measurements, systematic subsurface data obtained from three drillings at the toe of the investigated slope (vertical/sub-horizontally inclined boreholes, depths/length 100-270 m) are also available. Based on geological drill-core documentations and analyses of geophysical borehole-logs, the structural subsurface inventory was assessed and compared with the surface measurements.

Since the high rock faces, situated further upslope of the above mentioned outcrop measuring and drilling sites, are not accessible to directly analyse discontinuities and, in parts, are affected by potential rockfall hazards, these steep and rugged areas were investigated using terrestrial laser-scanning (TLS). The rock faces were scanned with a long-range scanner (Riegl Vz 4000) from five different scan-positions in the adjacent valley floor. The scanned area covers a total width of approx. 700m and a height difference of approx. 300m. In order to close data-gaps due to horizontally and very flatly inclined rock-surfaces, the TLS-data were combined with data obtained from an airborne laser-scanning (ALS) survey. The combined point-cloud data was processed and analysed in the GIS-software SAGA using the Laserdata LIS-extension.

Based on the different investigations performed and data thus obtained, the structural rock-mass model was refined and spatially extended for inaccessible rock faces. Furthermore, the laser-scan data can be used for slope monitoring (e.g. rockfall monitoring based on difference models).