



Fracture network analysis of faulted and lower deformed carbonates and quartzites on the example of the investigation area Sonnwendstein/Semmering, Austria

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Within a research project in the investigation area Sonnwendstein/ Semmering, Austria, hydrogeological homogenous units were worked out for a numerical realisation of a hydraulic model. For the determination of hydrogeological homogenous areas in fractured hard rocks the fracture networks of the different lithologies were recorded and quantified with a new statistical approach. These investigations included also the determination of fracture networks within fault zones in this investigation area.

Three lithological units were observed, which are deformed by the same tectonic processes. 17 exposures were observed and the fracture networks at the exposures were recorded. About 2000 fractures were recorded with the scan-line method and statistically analysed by their fracture attributes.

Two kinds of analysis were applied. On one side the frequency distributions of the aperture and the linear degree of separation of the recorded fractures were analysed and on the other side it was tried to determine statistically orientation related fracture set volumes. Both kinds of analysis were used to figure out if the fracture characteristics are bound primarily on lithological attributes or on the influence of fault zones.

It can be derived from the results of the frequency analyses that in the investigation area Sonnwendstein/ Semmering the fracture attributes of the hard rocks are more influenced by their distance to fault zones than by their lithological attributes.

The results of the statistical analyses of the orientation related fracture set volumes

enabled to determine three groups of exposures belonging to three hydrogeological homogenous units. The groups are summarized by the number of hydrogeological important fracture sets and the total fracture volume of each exposure. The exposure group with the lowest fracture network volume represents exposures in or in the nearness of fault zones. So in the investigation area the fault zones within all the three different lithologies show a lower permeability than the fracture network in the surrounding rock mass.