Weathering and alternation in granite has a deep impact on both geotechnical properties of the rock as well as of the rock mass. In a granite rock mass, the discontinuity pattern together with joint cohesion and friction plays a major role especially when prone to sliding. These phenomena could be exclusively studied at the Königshainer Berge Tunnel Project (Lausitz, Germany) where 3.5 km of tunnel and several kilometers of road cuts have been built in connection with the extension of the German Federal Freeway A4 to the Polish border. The two tubes provided an unique cross section through zones of intensive weathering and hydrothermal alteration within two-mica granites. During running excavation works, these zones could be studied intensively by proceeding a detailed engineering geological documentation, rock mass classification and rock and soil sampling, testing and monitoring.

The main topics of the extensive field studies and laboratory work were the characterization of each weathering stage with rock or soil properties such as mineral composition, compressive and tensile strength, young’s modulus, specific destruction work, cohesion, friction angle etc. One of the main observations was the increase of pore volume with the degree of weathering and therefore a distinct decrease of most of the rock properties.

A second topic was to get an idea of the distribution of the weathering zones in the rock mass along the tunnel section and the road cuts that are prone to sliding, and to evaluate the common geological model of granite weathering in dependence of discontinuity pattern and depth.

Some parts of the granites underwent two stages of hydrothermal alteration before being under surface conditions. Therefore it was necessary to distinguish between the effect of weathering and hydrothermal alteration on mineralogy as well as on geotechnical rock properties. Only after the endogene alteration processes had finished, the rock has been exposed to the exogene processes of weathering. The change of mineral content and the increase of pore volume promotes the action of chemical decomposition. Further, some geotechnical aspects of the different granite weathering and alteration stages and their influence on slope stability are discussed.