Geophysical Research Abstracts, Vol. 7, 05204, 2005
SRef-ID: 1607-7962/gra/EGU05-A-05204

The influence of lithology in the weathering of rhyolite tuff, weathering forms, changes in mineralogy and physical properties

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Five different types of rhyolite tuffs of the Eger castle (Hungary) and one type from a nearby quarry have been studied in detail. Mapping of wall sections reveals that the various types of tuffs showing specific weathering forms. On site tests and laboratory tests have demonstrated that the tuff is prone to weathering and its strength decreases dramatically when it is water saturated. Cemented tuff types do not show deep weathering, while porous pumice-rich tuff types display various weathering forms such as case hardening, multiple flaking, scaling and differential backweathering. An increase in clay content and secondary minerals such as calcite and gypsum are the mineralogical indicators of this type of weathering. Larger micro-pores have an adverse effect, while small micro-pores have less influence on the durability of tuff. Micro-drilling tests have shown that crust formation on rhyolite tuff leads to an increase in surface strength. The thermal dilation of the rhyolite tuff varies between 0.2-0.4 mm/m at 90˚C. After cooling down to room temperature, a contraction of 0.1 mm is observed which is reversible in a humid environment. The sensitivity to weathering is strongly controlled by lithology, especially by fabric properties including size and frequency of pumice, percentage and cementation of groundmass and by pore-size distribution.