Geophysical Research Abstracts, Vol. 8, 05798, 2006
SRef-ID: 1607-7962/gra/EGU06-A-05798

Dependence of physical properties on the water content and textural properties of Hungarian travertine

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The travertine has been quarried in and around Budapest for thousands of years from the Roman period. It has been used for several important constructions such as aqueducts or fortresses on both sides of the Danube. This rock is a continuously popular dimension stone and has been used for several public buildings. For conservation and reclamation of these buildings and monuments one of the most important tasks is to determine the effect of water content on rock strength. Due to variations in deposition and post-depositional diagensis various types of travertine exist. Despite the wide range of lithologies most travertine belongs to two lithotypes: laminated porous travertine and less porous massive travertine. Several different blocks including both types were tested under laboratory conditions to asses the changes of physical properties of dry and water saturated samples and to analyse the influence of fabric on travertine properties. The following data were analysed: apparent density, ultasonic wave velocity, uniaxial compressive strength, tensile strength and elastic modulus. For each of these samples, five specimens were tested and the average results obtained. A linear regression has been established between the rock mechanical parameters for both dry and saturated materials of various types. The slopes of the lines are close to each other, and thus it can be assumed that the influence of the degree of saturation is the same for the different petrophysical parameters. The relationship between the different rock mechanical parameters of various travertines was also examined. In every case, the slopes of the trend lines were independent of the water content. In addition, an exponential relationship between the density and the measured strengths (uniaxial compressive and tensile) and elastic modulus was obtained for both dry and saturated conditions.