Geophysical Research Abstracts, Vol. 7, 04116, 2005
SRef-ID: 1607-7962/gra/EGU05-A-04116

Quantification of volume changes of heavy soils of East Slovakian Lowland

M.Gombos (1) and J.Sutor (2)
Institute of Hydrology, Slovak Academy of Sciences (sutor@uh.savba.sk|

Quantification of volume changes of heavy soils of East Slovakian Lowland

Július Łútor and Milan GomboŽ

Institute of Hydrology, Slovak Academy of Sciences, Bratislava, Slovakia

Volume changes of heavy soils when shrinking and swelling are significant processes because they are accompanied with soil surface decreasing and cracks formation. Predominantly, formation and dynamics of cracks have an important impact on transport processes in heavy soils and consequently on their water regime. East Slovakian Lowland (ESL) belongs to the most important regions of Slovakia from the point of view of heavy soils occurrence. 45% of entire soil survey of ESL belongs to heavy soils. Relatively small attention has been paid to heavy soils volume changes of the region up to now. Results of heavy soils changes laboratory analysis of six locations of ESL characterised by different particle size distribution, namely content of I. category particles (from 23% to 89%), are introduced in the presented study. The analysis of volume and moisture changes course was realised during drying the taken away soil samples under laboratory conditions. Dependence of volume changes on soil moisture and content of I. cat. particles was obtained. Statistic-empirical models for volume changes dependent on particle size distribution and volume moisture were obtained by linear correlation application The study presents results of quantification of volume changes of heavy soils based on laboratory measurements of size of their samples (the total of 90 samples) exposed to conditions of drying during 30 and a half of an hour. The obtained data files concerning the changes of their bulk were consecutively used for evaluation of: a) The course of volume changes of soils with the different particle size distribution during drying, b) Volume changes of soils with different water contents and with different content of 1. fraction or I. cat., c) The course of volume changes of

soils with the different particle size distribution depending on their water content, d) 3-D demonstration of volume changes of soils depending on the water content and the particle size distribution, The presented results show clearly that volume changes are possible to quantify depending on different soil characteristics. On the grounds of this fact, the data files were processed by statistical analysis namely the regressive analysis of dependence of volume changes on the water content and some other physical soil properties. Different combinations of the physical properties namely the independent variables enabled us to construct some empirical-mathematical models for assessment of volume changes of heavy soils. It is possible to consider the models to be pedo-transfer functions (equations for quantification of the volume changes of heavy soils). Overall, 4 PTF concerning the properties were formulated. Quantification of volume changes of soils with different particle size distribution from direct measurements and mathematical models for water contents reached after 10 and a half an hour of the soil drying are presented. There is present measured volume changes together with calculated changes using the constructed models for soils with different particle size distributions. It is clear from the visualised results that the model number 3 is the most appropriate or precise. This model was used for 3-D demonstration of the volume changes. Comparison with a similar demonstration using the measured data showed a good congruence. Construction of mathematical-statistical models (PTF) for quantification of volume changes of heavy soils depending on the water content and their particle size distribution give us an effective tool for management of optimisation of water regime of heavy soils in the region of East Slovakian Lowland.