Geophysical Research Abstracts,
Vol. 10, EGU2008-A-00850, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-00850
EGU General Assembly 2008

Relief unity emulator applied to slope stability analysis

A. C. Colangelo

Department of Geography, FFLCH, University of São Paulo-São Paulo, Brazil

(accolang@usp.br / Fax: +55 11-30913159 / Phone: +55 11-30913769)

The subject of this work is to apply the slope stability analysis in a new tool that I created and named a “Relief Unity Emulator”, or “RUE”. With this tool, is possible synthesize a relief unity and simulate a complete evolution cycle over it. With addition of mechanical and hydrological models, “RUE” permits to perform a detailed slope stability analysis, in space and time. The spatial behaviour of critical depths for slope stability and the behaviour of their correlated variables in the soil-regolith transition along slope profiles over granite, migmatite and mica-schist parent materials was analysed for an humid tropical simulated environment conditions. Sixteen variables were included in the “RUE” engine, and their values estimated. A number of field measures about shear strength for residual soils and regolith materials was made, by means of soil “Cohron Sheargraph” apparatus and evaluated the shear stress tension behaviour at soil-regolith boundary along slope profiles, in each referred lithology. In the limit equilibrium approach applied in the “RUE” we adapt the infinite slope model for slope analysis in a set of slope profiles that compounds a synthetic unity relief. Any slope profiles were sliced by means of finite element solution like in Bishop method. In our case, we assume that the potential rupture surface occurs at soil-regolith or soil-rock boundary in slope material. For each slice, the factor of safety was calculated considering the value of shear strength (cohesion and friction) of material, soil-regolith boundary depth, soil moisture level content, slope gradient, top of subsurface flow gradient, apparent soil bulk density. The correlations showed the relative weight of cohesion, internal friction angle, apparent bulk density of soil materials and slope gradient variables with respect to the evaluation of critical depth behaviour for different simulated soil moisture content levels at slope profile scale. Some important results

refer to the central role of behaviour of soil bulk-density variable along slope profile during soil evolution and in present day, because the intense clay production, mainly Kaolinite and Gibbsite at B and C-horizons, in the humid tropical environment. If the clay content of soil increase, a fall of friction angle and bulk density of material is observed. We have observed too at threshold conditions, that a slight change in soil bulk-density and friction angle values may disturb drastically the equilibrium of stress-strength tensions at potential rupture surface with its consequent loss of stability and increase of landslide hazard.