Geophysical Research Abstracts,
Vol. 10, EGU2008-A-02219, 2008
EGU General Assembly 2008

Geotechnical and minero-petrographical investigation of fine grained soils affected by soil slips: a case of study from Central Calabria (Southern Italy)

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Shallow and fast sliding-flow instabilities, are dangerous phenomena produced by frequently shallow landsliding events related to rainstorms and, in many cases, these slips affect essentially the degraded or weathered covers of soil. In this work has been illustrated an integrated study, based on mineralogical and geotechnical investigations, aimed to improve the characterisation of fine grained soils sampled in different Central Calabria sites (Southern Italy), in which have been involved soil slip phenomena. This approach is crucial to better understand the magnitude and distribution of shallow landsliding events in such soils. The high incidence of soil slips in an area of Central Calabria prompted a research aimed at geotechnical characterisation of fine-grained soils involved in this kind of instability. The XRD patterns of whole-rocks show that the analyzed samples are rich in clay minerals associated with significant amounts of calcite, quartz and feldspars, whereas minor concentrations of dolomite have been identified in some XRD patterns. The <2 μm grain-size fraction of all the samples is composed predominantly of illite, followed by illite-smectite mixed layers, chlorite and kaolinite. The differences among silts and clays are related to the clay mineral contents. The clay soils show a higher percentage of clay minerals and lower content of feldspars, dolomite and quartz. These differences are minor, and do not significantly affect the plasticity and activity features. The degradation cycles simulated in the laboratory do not produce mineralogical and chemical changes in tested clay. However cycles of wetting-drying-freezing-thawing have disturbed the natural structure of

the soil, producing changes in fabric and bonding. The stress-displacement curves obtained from direct shear tests on intact silts and clays show a well-defined peak strength in contrast to similar tests on the degraded specimens. Peak shear strength shows a reduction during one month of degradation; after this period no further meaningful change is observed. The reduction of the peak shear strength due to the degradation induced in the laboratory is comparable to the residual conditions. In conclusion, the approach used and the results proposed in this paper represents valuable support for the study of shallow landslide susceptibility in fine grained soils.