



## **Relationship between the residual shear strength and the methylene blue value in weathered clay soils.**

**C. Meisina**

University of Pavia, Department of Earth Sciences, Via Ferrata n°1, 27100 Pavia  
(cmeisina@manhattan.unipv.it)

The residual shear strength play an important role in the slope stability analysis, especially in the assessment of the engineering properties of clay soils which contain pre-existing shear surfaces. This type of soils is very diffused in the Italian Apennines; it corresponds to highly tectonized varicoloured clays, to flysch formations (alternating layers of clay shales with calcareous arenaceous marls) and to their weathering products (clays with diffused lapideous fragments of different size), which are often responsible of shallow landslides. The residual shear strength has been studied extensively in the laboratory and various attempts have been made to correlate this parameter with soil index properties (clay fraction, plasticity index, liquid limit, etc...). Nevertheless, these correlations cannot be universally applicable to all soils, sometimes they are useful to evaluate trends but not for practical applications. The residual shear strength is strongly controlled by clay mineralogy and by the quantity of clay-size particle. The “value of blue” (the quantity of blue methylene consumed per 100 g of soil) is an indicator of the amount of clay and of the type of clay mineral; it is measured with the blue methylene test, that is based on the property of the organic blue methylene dye which is adsorbed by negatively charged soil particles when in solution forming a monomolecular layer. The research proposes a new correlation between the residual shear strength and the methylene blue value (“value of blue”) for weathered clay soils on argillaceous bedrock (varicoloured clays and flysch) of the Oltrepo Pavese area (Northern Italy) which can be considered as geologically representative of a large part of the Italian Apennines. Shallow landslides occur periodically in these soils due to high intensity rainfalls. A number of soils were tested. Trench pits were used for sampling and for the soil profile description (lithology, structure, grade of weathering, thickness). Field surveys were integrated with some classical geotech-

nical laboratory tests (index properties, suction and volumetric characteristic). The methylene blue dye adsorption (“value of blue”) was determined in accordance with the French AFNOR standards. The residual strength friction angle was measured with direct shear tests; the procedure employed for the measure involved inserting the soil at the liquid limit in the direct shear ring, applying consolidation in stages and then shearing (Kanji method). The value of blue test is easy and rapid to perform and appears to be a very good indicator of the residual strength friction angle for the tested soils.