



## **An integrated methodology to evaluate the effects of plants for slope stability**

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The topic of eco-hydrological dynamics is fundamental in slope stability analysis on vegetated soils.

The understanding of hydrological processes are based on the knowledge of the geotechnical properties of soils, on the pedological, pluviometrical and vegetational features and they are all related to the soil and roots interaction.

To quantify the stability slopes effects that the root systems provide to the soil, it is important to know their spatial distribution and their tensile strength.

Because of the difficulty to estimate the action of single roots, in the stability evaluation of vegetated hillslopes, only the additional root cohesion is generally taken into account depending on the spatial variability of the root area ratio RAR (the ratio between the area occupied by roots in a unit area of soil) distribution (especially with depth), even if it is not sure that all the roots in the soil actually mobilise their whole tensile strength (e.g. each root could not break at the same time due to different tortuosity and elasticity).

In this paper we test some analysis and methodologies:

- to value the stress-strain curve and ultimate tensile strength of the roots, we use two different testing machines normally employed for wood rheological behavior studies.
- to value the cohesion contribution to rooted soil samples we use a geotechnical apparatus (the Casagrande direct shear test);
- an indirect methodology to obtain the measurement of the fundamental parameters of the root apparatus;
- an indirect methodology to estimate the analytical descriptors of the root apparatus based on climatic and pedological features;
- a GIS survey to estimate the stability factor and its evolution with some models in different vegetation management.

Mediterranean environments, particularly, where soils are shallow and water is scarce over the growing season (water controlled ecosystems), it would be more economical for plants to have the roots closer to the soil surface. This could be relevant for the abandoned slopes in the Mediterranean basin where root development has to balance the increasing infiltration capacity during re-vegetation.

Such knowledge is very important for the slope stability valuation and hydrological and hydro geological dynamics understanding.