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Analysis of factors influencing the calibration of the Root Bundle Model (RBM): the case study of the Hyrcanian forests (Iran)

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Plants have a protective role in the mitigation of risks due to natural hazards such as landslides. The quantification of root reinforcement is fundamental for the development of bioengineering techniques and the improvement of protection forest management. Although there are several models used for root reinforcement calculations, there is incertitude about the type and quantity of data needed for the calibration of those models. In this work the influence of several factors such as tree species and regions on the root mechanical properties and root spatial distribution is investigated. A total of 16200 laboratory tensile tests (with root diameters up to 1 cm) and root distribution of 1080 soil trenches were collected to investigate the sensitivity of root reinforcement calculation due to different factors: location within the root system (6 trenches and 90 tensile test samples in the up or down direction, respectively), number of investigated trees (5 trees per region), tree dimensions (three stem diameter classes), sites (three different sites), and tree species (Oriental beech or European hornbeam).
Preliminary results show that the most important factors influencing the root reinforcement calculation are the species and the site. Moreover, the calibration based on single tree datasets (tensile test samples and root distribution) are not representative compared to that of multiple trees.
The final results of this work will allow, for the first time, the formulation of standards required to plan field campaigns aiming to collect data for the calibration of root reinforcement models. Overall, the analysis of this study represent a fundamental contribution in the quantification of the protection effects of forests in the Hyrcanian region. Future work is planned to assess the influence of different root mechanical testing methods (tensile tests versus field pullout tests), and of testing coarse roots with diameters larger than 1 cm.