EGU25-13432, updated on 16 Dec 2025
https://doi.org/10.5194/egusphere-egu25-13432
EGU General Assembly 2025

An integrated approach to combat desertification in Mediterranean mountain environments: UAV surveys and slope stability modelling in agricultural terrace systems

Aman Kumar Meena[1], Ioannis Sofokleous[1], Niovi Christodoulou[1], Hakan Djuma[1], Christos Zoumides[1], Federica Lucini[2], Corrado A.S. Camera[2], and Adriana Bruggeman[1]

[1]The Cyprus Institute, Nicosia, Cyprus (office.school@cyi.ac.cy)

[2]Università degli Studi di Milano, Milan, Italy (uni.comunicazione@unimi.it)

Land desertification driven by land abandonment and a changing climate raises new concerns for the sustainability of Mediterranean mountain environments. The use of heavy machinery for the establishment of mountain terraces is replacing traditional manual terracing methods, offering new opportunities and challenges in mountain farming. This study aims to demonstrates that the potential risks of terrace failures can be effectively identified by integrated approaches of aerial surveys and process-based models equipped with hydrological and slope stability parameters, contributing to design of sustainable and robust mountain terraces environment. The objectives of this research are: i) to apply aerial surveys and Structure-from-Motion (SfM) photogrammetry for monitoring slope failures in agricultural mountain terraces; and ii) to assess the stability of terraced slopes using a process-based modelling approach. Two terraced sites, located in Oikos and Agros communities in the Troodos Mountains of Cyprus, dedicated to grape cultivation for wine making, were selected for this study. Surveys with an Unmanned Aerial Vehicle (UAV) were conducted to generate digital surface models and terrain maps using the SfM technique. Field assessments and back analysis were performed to determine the range of hydrological, mechanical and geometrical parameters of the terraces and supporting dry-stone walls. These parameters were incorporated into a slope stability model to evaluate terrace deformations under different soil moisture conditions. Additional UAV-based surveys will be made following intense rainfall events that induce soil erosion and collapsing of dry-stone walls. A process-based hydrological model will be used to analyse soil moisture dynamics (infiltration and sub surface runoff) of damaging rainfall events at the study site. The obtained data will be used as input for improving the parametrization of the slope stability model simulations.

This research has received financial support from the REACT4MED Project (GA 2122), which is funded by PRIMA, the Partnership for Research and Innovation in the Mediterranean Area, a Programme supported by Horizon 2020, the European Union's Framework Programme for Research and Innovation.