Geophysical Research Abstracts
Vol. 16, EGU2014-13683, 2014
EGU General Assembly 2014

Monitoring of a landslide stabilized with bioengineering techniques in 1997, northern Tuscany. Vegetation development analysis and state of preservation of wood

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In 1996 a large landslide occurred in the chestnut grove nearby Pomezzana, a small town situated in the mountains of northern Tuscany, Italy. No damages were registered to population nor infrastructures, but the residual risks deriving from the effects of the event needed to be solved by means of a stabilization of the ground and reforestation. The choice has been found among bioengineering techniques, which perfectly fit in the ecosystem, landscape and the economic budgets of mountain engineering.
A complex project has been implemented, using several different typologies of wooden structures, combined with rooted plants, wooden cuttings and grass seeding on the slopes. The most of the stabilization effect was assigned to the cribwalls, construct using local chestnut wood. Works ended in 1997.
In 2013, 16 years later, a monitoring on the vegetation development and the state of preservation of the wood in cribwalls has been conducted.
On vegetation, it has been surveyed the composition of species, diameter and height. Moreover, by means of a GPS device, the position of every plant has been registered and transcribed on GIS softwares for elaboration.
The conservation of wood in cribwalls has been checked using a Resistograph, drilling each structure in three areas (at the two ends and roughly in the middle) and testing every order.
The root systems of two plants have been excavated to calculate the RAR value for different depths, in order to quantify the contribution of roots in land stabilization. The soil has been also analyzed to determine structure, texture and geotechnical properties. Combining these data with the topographic survey conducted by the designers of the work, it has been possible to calculate the Safety Factor for landslide triggering using the model Slip4ex.
The results show a good preservation rate of wooden structures, combined with a high contribution of roots in stabilization. The registered tree species (mainly Alnus glutinosa) were almost all coming from the nearby forests, while there are just small tracks of the original plantation.