Geophysical Research Abstracts
Vol. 15, EGU2013-7704, 2013
EGU General Assembly 2013

Assessing the efficiency of Mediterranean ditch networks in preventing vineyards soil erosion within landscape

Florent Levavasseur (1), Jean-Stéphane Bailly (2,3), and Philippe Lagacherie (1)

(1) INRA, UMR LISAH, F-34060 Montpellier, France, (2) AgroParisTech, UMR LISAH, F-34060 Montpellier, France, (3) AgroParisTech, UMR TETIS, F-34093 Montpellier, France

Water erosion of cultivated soils is a threat to the sustainability of agriculture, especially in Mediterranean areas. For a long time, Mediterranean farmers have thus adopted some soil conservation practices. Actual ditch networks, which are generally associated with terraces, result from historical successive farmer settlements and are one of these soil conservation practices. By intercepting surface run-off, ditches decrease slope length and prevent soil erosion on downstream plots. However, since water erosion hazard and ditch network geometries are highly variable in vineyards landscape and since ditch building and maintaining are costly, the objective of this study was to identify and map the resulting efficiency of ditch networks in preventing soil erosion.

For a given area, a ditch network efficiency is defined here as the balance between the network density, i.e. network cumulated length for a given area unit, and the erosion sensitivity over an area which measures the performance of the ditch network in limiting soil erosion. The erosion efficiency of ditch networks was thus identified using both i) computer generated ditch networks with various spatial configurations and ii) the stream power index as an erosion sensitivity indicator, computed from a DTM in which each ditch network was burned. The stream power index of the actual networks were compared with a set of generated networks whose density and topology were selected to maximize the performance in preventing soil erosion thanks to the use of a self-developed optimized stochastic network generator.
For four 1 km^2 hillslopes, we showed that the performances of actual networks to prevent soil erosion was among the best that were obtained by simulated networks with even greater densities. Furthermore, we showed that the stream power index values that accounted for the actual ditch networks to prevent soil erosion hazard was both minimal and weakly variable in the whole study area (30 km^2) at hillslope scale, whatever the other erosion factors, namely topography and landuse. This suggested that densities and topologies of actual ditch networks in the catchment have been optimized by farmers through individual acts along the last centuries in order to limit the soil erosion hazard. This also confirms there is very little room to propose new ditch network spatial configurations that better prevent vineyards soil erosion.