Geophysical Research Abstracts
Vol. 19, EGU2017-6878, 2017
EGU General Assembly 2017
© Author(s) 2017. CC Attribution 3.0 License.

Changes in hydrological connectivity due to vegetation recovery and wall collapse in abandoned terraced fields

Noemí Lana-Renault (1), Manuel López-Vicente (2), Rafael Oranjuren (1), José Ángel Llorente (1), Purificación Ruiz-Flaño (1), and José Arnáez (1)

(1) University of La Rioja, DCH, Physical Geography, 26009-Logroño, Spain (noemi-solange.lana-renault@unirioja.es), (2) Dept. of Soil and Water, Experimental Station of Aula Dei, EEAD-CSIC, 50059-Zaragoza, Spain

Agricultural terraces have been built in mountain regions worldwide in order to provide a larger surface for cultivation, improve water availability and reduce soil erosion, as they favour infiltration and reduce runoff and sediment connectivity from hillslopes to streams. In many Mediterranean countries, farmland abandonment has led to progressive natural revegetation and, in terraced slopes, due to a lack of maintenance, to a collapse of the water conservation structures, often followed by small mass movements and gullying. Little is known about the effect of such failures on the hydrological system, especially at catchment scale. The aim of this study is to contributing to fill in this gap by exploring the effect of vegetation recovery and terrace failure on hydrological connectivity in a small catchment (192 ha) in northern Spain mostly occupied by abandoned terraced fields. For this purpose, we applied a modified version of the Borselli's index of runoff and sediment connectivity (IC). Besides using the C-RUSLE factor, as used by many authors, we tested the inclusion of an infiltration component (Kf) to assess the landscape-weighting factor. The Kf factor accounted for the high infiltration rates observed in the terraced soils and was estimated using the permeability classes of the K-RUSLE factor. A 2x2 m resolution DEM was used to capture the terraced fields and run the IC model. Following the recommendation of Cavalli et al. (2015), we used the D-infinity flow accumulation algorithm (Tarboton, 1997) to represent the real flow paths, especially on hillslopes, where divergent flow predominates, and on stream channels. To ensure the continuity of the flow path lines, local sinks were filled in with the algorithm of Planchon & Darboux (2001) that preserved a minimum slope gradient of 0.01 degrees. Finally, linear landscape elements such as stonewalls, rock outcrops, and trails and forest roads were also considered. The IC was calculated for the current scenario and the results were validated in the field by identifying stable, erosion, delivery and sedimentation forms in a representative sub-catchment. We then applied the IC for the past scenario, when all terraced fields were cultivated, and we analysed the changes in connectivity due to farmland abandonment, including the separate effect of changes in vegetation, linear landscape elements and water conservation structures. Results of this study have implications for other agro-ecosystems sensitive to farmland abandonment as well as where terrace failure may happen.