Geophysical Research Abstracts
Vol. 19, EGU2017-18042-1, 2017
EGU General Assembly 2017

The scale effect on soil erosion. A plot approach to understand connectivity on slopes under cultivation at variable plot sizes and under Mediterranean climatic conditions

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It is well known that soil erosion changes along time and seasons and attention was paid to this issue in the past (González Hidalgo et al., 2010; 2012). However, although the scientific community knows that soil erosion is also a time spatial scale-scale dependent process (Parsons et al., 1990; Cerdà et al., 2009; González Hidalgo et al., 2013; Sadeghi et al., 2015) very little is done on this topic. This is due to the fact that at different scales, different soil erosion mechanisms (splash, sheetflow, rill development) are active and their rates change with the scale of measurement (Wainwright et al., 2002; López-Vicente et al., 2015). This is making the research on soil erosion complex and difficult, and it is necessary to develop a conceptual framework but also measurements that will inform about the soil erosion behaviour. Connectivity is the key concept to understand how changes in the scale results in different rates of soil and water losses (Parsons et al., 1996; Parsons et al., 2015; Poeppl et al., 2016). Most of the research developed around the connectivity concept was applied in watershed or basin scales (Galdino et al., 2016; Martínez-Casasnovas et al., 2016; López Vicente et al., 2016; Marchamalo et al., 2015; Masselink et al., 2016), but very little is known about the connectivity issue at slope scale (Cerdà and Jurgensen, 2011).

El Teularet (Eastern Iberian Peninsula) and Sparacia (Sicily) soil erosion experimental stations are being active for 15 years and data collected on different plots sizes can shed light into the effect of scale on runoff generation and soil losses at different scales and give information to understand how the transport of materials is determined by the connectivity between pedon to slope scale (Cerdà et al., 2014; Bagarello et al., 2015a; 2015b). The comparison of the results of the two research stations will shed light into the rates of soil erosion and mechanisms involved that act under different scales.

Our research share information collected during the last 15 years in the Sparacia and El Teularet soil erosion experimental stations under the same management and research how the concept of connectivity can help us to have a better understanding of the soil erosion process, and the effect of scale. All the data will be treated to show the runoff and sediment eroded at different plot sizes to understand how the sediment is transported at event scale. The rainfall characteristics will be also analysed to understand the soil erosion processes at different scales.

Acknowledgements

The research leading to these results has received funding from the European Union Seventh Framework Programme (FP7/2007-2013) under grant agreement n 603498 (RECARE project) and the CGL2013- 47862-C2-1-R and CGL2016-75178-C2-2-R national research projects.

References

Bagarello, V., Ferro, V., Pampalone, V. 2015b. A new version of the USLE-MM for predicting bare plot soil loss at the Sparacia (South Italy) experimental site. Hydrological Processes, 29(19), 4210-4219.

Bagarello, V., Ferro, V., Giordano, G., Mannocchi, F., Pampalone, V., Todisco, F. 2015a. A modified applicative criterion of the physical model concept for evaluating plot soil erosion predictions. Catena, 126, 53-58.

Cerdà, A. and M. F. Jurgensen. 2011. Ant Mounds as a Source of Sediment on Citrus Orchard Plantations in Eastern Spain. A Three-Scale Rainfall Simulation Approach. Catena 85 (3): 231-236. doi:10.1016/j.catena.2011.01.008.

Cerdà, A., Giménez-Morera, A., Jordan, A., Pereira, P., Novara, A., Keesstra, S., Sinoga, J. D. R. 2015. Shrubland as a soil and water conservation agent in Mediterranean-type ecosystems: The Sierra de Enguera study site contribution. Monitoring and Modelling Dynamic Environments, 45.

Cerdà, A., R. Brazier, M. Nearing, and J. de Vente. 2013. Scales and Erosion. Catena 102: 1-2.

doi:10.1016/j.catena.2011.09.006.
Galdino, S., E. E. Sano, R. G. Andrade, C. R. Grego, S. F. Nogueira, C. Bragantini, and A. H. G. Flosi. 2016. Large-Scale Modeling of Soil Erosion with RUSLE for Conservationist Planning of Degraded Cultivated Brazilian Pastures. Land Degradation and Development 27 (3): 773-784. doi:10.1002/ldr.2414.
Gonzalez-Hidalgo, J. C., R. J. Batalla, A. Cerdá, and M. de Luis. 2010. Contribution of the Largest Events to Suspended Sediment Transport Across the USA. Land Degradation and Development 21 (2): 83-91. doi:10.1002/ldr.897.
Gonzalez-Hidalgo, J. C., R. J. Batalla, A. Cerdà, and M. de Luis. 2012. A Regional Analysis of the Effects of Largest Events on Soil Erosion. Catena 95: 85-90. doi:10.1016/j.catena.2012.03.006.
Gonzalez-Hidalgo, J. C., R. J. Batalla, and A. Cerdà. 2013. Catchment Size and Contribution of the Largest Daily Events to Suspended Sediment Load on a Continental Scale. Catena 102: 40-45. doi:10.1016/j.catena.2010.10.011.
López-Vicente, M., E. Nadal-Romero, and E. L. H. Cammeraat. 2016. Hydrological Connectivity does Change Over 70 Years of Abandonment and Afforestation in the Spanish Pyrenees. Land Degradation and Development. doi:10.1002/ldr.2531.
López-Vicente, M., L. Quijano, L. Palazón, L. Gaspar, and A. Navas. 2015. Assessment of Soil Redistribution at Catchment Scale by Coupling a Soil Erosion Model and a Sediment Connectivity Index (Central Spanish Pre-Pyrenees). Cuadernos De Investigacion Geografica 41 (1): 127-147. doi:10.18172/cig.2649.
Marchamalo, M., J. M. Hooke, and P. J. Sandercock. 2016. Flow and Sediment Connectivity in Semi-Arid Landscapes in SE Spain: Patterns and Controls. Land Degradation and Development 27 (4): 1032-1044. doi:10.1002/ldr.2352.
Martínez-Casasnovas, J. A., M. C. Ramos, and G. Benites. 2016. Soil and Water Assessment Tool Soil Loss Simulation at the Sub-Basin Scale in the Alt Penedès-Anoia Vineyard Region (Ne Spain) in the 2000s. Land Degradation and Development 27 (2): 160-170. doi:10.1002/ldr.2240.
Masselink, R.J.H., S.D. Keesstra, A J.A.M. Temme, M. Seeger, R. Giménez, J. Casalí. 2016. Modelling Discharge and Sediment Yield at Catchment Scale using Connectivity Components. Land Degradation and Development 27 (4): 933-945. doi:10.1002/ldr.2512.
Parsons, A.J., Abrahams, A.D., Luk, S.H. 1990. Hydraulics of interrill overland flow on a semi-arid hillslope, southern Arizona. Journal of Hydrology, 117(1), 255-273.
Parsons, A.J., Abrahams, A. D., Wainwright, J. 1996. Responses of interrill runoff and erosion rates to vegetation change in southern Arizona. Geomorphology, 14(4), 311-317.
Parsons A.J., Bracken L., Peoppl , R., Wainwright J., Keesstra, S.D., 2015. Editorial: Introduction to special issue on connectivity in water and sediment dynamics. In press in Earth Surface Processes and Landforms. DOI: 10.1002/esp.3714
Poeppl, R.,E. Maroulis, J., Keesstra, S.D., 2016. Geomorphology. A conceptual connectivity framework for understanding geomorphic change in human-impacted fluvial systems. http://dx.doi.org/10.1016/j.geomorph.2016.07.033
Sadeghi, S.H.R., Gholami, L., Sharifi, E., Khaledi Darvishan, A., Homaee, M. Scale effect on runoff and soil loss control using rice straw mulch under laboratory conditions. (2015) Solid Earth, 6 (1), pp. 1-8.. DOI: http://dx.doi.org/10.5194/se-6-1-2015
Wainwright, J., Parsons, A.J., Schlesinger, W.H., Abrahams, A.D. 2002. Hydrology–vegetation interactions in areas of discontinuous flow on a semi-arid bajada, southern New Mexico. Journal of Arid Environments, 51(3), 319-338.