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Runoff experiment and adapted SfM photogrammetry to assess rill erosion in Mediterranean agricultural fields from a holistic point of view

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In Mediterranean agricultural fields, more research is needed to quantify soil loss and to assess runoff generation caused by unsuitable land management strategies (García-Díaz et al., 2017; Keesstra et al., 2016). Nowadays, farmers are increasing the generation of rills and, consequently, enhancing several sub-processes related to soil erosion by water such as headcut retreats, piping or cracks joint to mass movements (Marzolff and Poesen, 2009; Poesen et al., 2003; Rodrigo Comino et al., 2015). This complex problem under different spatiotemporal scales hinders a reliable forecasting of its final consequences (Prasuhn, 2011; Salome et al., 2014). Several researchers pay more attention to point observations, but no to general and connected overviews of processes related to forms and the quantitative functioning of all elements.

Therefore, the main goal of this study is to characterize and quantify the rill erosion generated by these degradation processes. To achieve this goal, two runoff experiments were carried out with two repetitions (dry and wet conditions) under extreme conditions (Wirtz et al., 2013, 2012, 2010): a motor driven pump discharged a water inflow up to ∼4.2 l s-1 maintained during between 4 and 6 minutes (≈1000 litres). Additionally, a 3D-captation of the rill by an adapted SfM photogrammetry was performed to assess: i) clear visible zonation of geomorphological (structural) connectivity features; ii) runoff and sediment productions close to the catchment outlet under actual conditions; iii) topsoil-subsoil interaction and crusting crucial for runoff generation; and, iv) the area with evidence of (former) high erosion intensity now stable, but with remnant.

García-Díaz, A., Bienes, R., Sastre, B., Novara, A., Gristina, L., Cerdà, A., 2017. Nitrogen losses in vineyards under different types of soil groundcover. A field runoff simulator approach in central Spain. Agric. Ecosyst. Environ. 236, 256–267. doi:10.1016/j.agee.2016.12.013

Keesstra, S., Pereira, P., Novara, A., Brevik, E.C., Azorin-Molina, C., Parras-Alcántara, L., Jordán, A., Cerdà, A., 2016. Effects of soil management techniques on soil water erosion in apricot orchards. Sci. Total Environ. 551–552, 357–366. doi:10.1016/j.scitotenv.2016.01.182

Marzolff, I., Poesen, J., 2009. The potential of 3D gully monitoring with GIS using high-resolution aerial photography and a digital photogrammetry system. Geomorphology, GIS and SDA applications in geomorphology 111, 48–60. doi:10.1016/j.geomorph.2008.05.047

Poesen, J., Nachtergaele, J., Verstraeten, G., Valentin, C., 2003. Gully erosion and environmental change: importance and research needs. Catena, Gully Erosion and Global Change 50, 91–133. doi:10.1016/S0341-8162(02)00143-1

Rodrigo Comino, J., Brings, C., Lassu, T., Iserloh, T., Senciales, J., Martínez Murillo, J., Ruiz Sinoga, J., Seeger, M., Ries, J., 2015. Rainfall and human activity impacts on soil losses and rill erosion in vineyards (Ruwer Valley, Germany). Solid Earth 6, 823–837. doi:10.5194/se-6-823-2015

Wirtz, S., Seeger, M., Ries, J.B., 2012. Field experiments for understanding and quantification of rill erosion processes. Catena 91, 21–34. doi:http://dx.doi.org/10.1016/j.catena.2010.12.002

Wirtz, S., Seeger, M., Ries, J.B., 2010. The rill experiment as a method to approach a quantification of rill erosion process activity. Z. Für Geomorphol. NF 54, 47–64.

Wirtz, S., Seeger, M., Zell, A., Wagner, C., Wagner, J.-F., Ries, J.B., 2013. Applicability of Different Hydraulic Parameters to Describe Soil Detachment in Eroding Rills. PLoS ONE 8, 1–11. doi:10.1371/journal.pone.0064861