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Hydrology and Earth System Sciences Discussions

Interactive comment on "Identifying erosive periods by using RUSLE factors in mountain fields of the Central Spanish Pyrenees" *by* M. López-Vicente et al.

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Answer to the comments of the Referee #1

One of the most relevant questions in soil erosion studies is to determine when erosive rain occurs and erosion happens. It is widely kwon that extreme events and events of heavy rain explain most of the soil losses, especially in Mediterranean areas where rainfall events with high intensity are frequent. Moreover, temporal variations in soil properties and tillage practices lead changes in soil loss rates. Hence, the identification of such events and the distinction of erosive periods is a main issue for a sound assessment of processes that trigger erosion. Therefore, the information gained can

be used to promote soil conservation practices as well as to plan the application of best management practices to preserve the highly fragile Mediterranean agrosystems.

The study area is located in a representative region of the agricultural landscapes in Mediterranean mountain areas. For that reason we consider that the selected fields provide useful information about erosion processes in agricultural soils of such environment.

We used rainfall data from the Canelles weather station because it is the only available database with the necessary temporal resolution to calculate the rainfall erosivity such it appears in the RUSLE model. Moreover, the monthly and annual values of the rainfall and runoff erosivity factor do not vary over the surface of the study area. However, we agree with the suggestion of the referee #1 about the necessary study of the spatial variability of the R factor at regional scale. Hence, we have estimated the annual value of R at the weather stations of Benabarre, Camporrélls and Canelles following the approach of Loureiro and Coutinho (2001) from monthly values of rainfall and little variation has been found. Moreover, the pattern of monthly rainfall intensity and rainfall volume is the same at the three weather stations. Therefore, the characteristics of the rainfall and runoff erosivity factor do not vary at the three weather stations for the three identified erosive periods.

The percentage of coarse fragments and organic matter and soil texture classification were estimated on the total of 60 soil samples. For a better comprehension we have added a map with the location of the sampling sites. The classes of soil permeability and soil aggregate structure were estimated for each soil type identified in the study area. All these values were used to calculate the soil erodibility factor. This information appears in the second paragraph of the subsection “2.5 Data collection”. Values of the soil erodibility factor change within each soil type in accordance with the spatial variability of the percentage of coarse fragments, organic matter and clay and silt content.

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In accordance with the referee #1 we explain with more detail the effect of coarse fragments in the assessment of the soil erodibility factor. Coarse fragments reduce the saturated hydraulic conductivity in a percentage of 23.3 % that is similar to the mean percentage of coarse fragments in the soil profile for the study area. However, the effect of these changes in the values of the class permeability sub-factor of the Eq. (5) is limited to those areas with high values of coarse fragments obtaining a mean value of the soil erodibility factor that is only 2.5 % higher than the value calculated for the K factor without the effect of coarse fragments.

We have used the R, K and C factors to establish and characterize the erosive periods because these factors presents temporal variations along the year, whereas the L and S topographic factors are not time dependent. However, we agree with the referee #1 that the topographic factor may be included in the estimation of monthly and annual soil erosion. Nonetheless, the consideration of the L and S factors does not modify the identification and erosive pattern of the three erosive periods, because both L and S factors present the same values during the three erosive periods.

All the equations used to estimate the values of the R, K and C factors appear in the guide of the RUSLE model (Renard et al., 1997). Moreover, the RUSLE model has been widely used in Mediterranean environments and other areas around the world in the literature. Hence, our proposed methodology to identify erosive periods can be easily reproduced in other areas. However, in agreement with the recommendations of referee #1 we have considered the inclusion of the equations of the sub-factors of the C factor to facilitate the application of our methodology.

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