Accurate rainfall erosivity estimation from daily precipitation records in the Ebro basin (NE Spain)

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Precipitation is one of the major causal factors of soil erosion. Its direct impact in the soil and the runoff generated are involved in the concept of rainfall erosivity. Rainfall erosivity is a function of the storm kinetic energy and the raindrop size distribution. Accurate estimation of rainfall erosivity, such as the RUSLE R factor, need sub-hourly rainfall records which are hardly available with a good spatial and temporal coverage. The use of daily precipitation records would allow a better knowledge of rainfall erosivity. In this study rainfall erosivity was estimated from daily precipitation records and precipitation indices and compared with the RUSLE R factor computed by using 15-minutes rainfall data. Several goodness-of-fit and error statistics were used to determine the reliability of the estimations using daily data. Two approaches were used for estimating the annual rainfall erosivity from daily data:

First, daily precipitation records were transformed into daily rainfall erosivity by means of a seasonally-adjusted exponential relationship. The seasonal spatial distribution of the coefficients was coherent with the type of rainfall in the study area.

Second, the relationship between the annual rainfall erosivity and several precipitation intensity statistics computed from daily data series was explored by means of linear regression. The annual erosivity was highly related to the five maximum precipitation events occurred during the year, plus the maximum wet spell duration and the ratio between the average wet and dry spells duration.

Both methods yielded good estimations of the RUSLE R factor, providing an accurate means of predicting rainfall erosivity in the region. An in-depth comparison of both approaches was made considering several aspects besides the goodness-of-fit statistics.