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Modified Fournier index as a new metric of integrated degradability index

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In Spain the potential problems associated with excessive soil erosion has long been recognised. The Universal Soil Loss Equation is the most widely used erosion model being one of the parameters used precipitation. There are difficulties to build daily rainfall, measured by rain gauges with high variability, and their spatial distribution with low coverage meteorological stations. Fournier index (Fournier, 1960) is used to assess the rainfall erosivity based on monthly rainfall, alternatively to use rainfall intensity in time bases under one hour (eg., van der Knijff et al., 1999; Shamshad et al, 2008). We will based in this index concept to create a new index base on vegetation activity.

Fournier index (FI) includes all monthly rainfall elevating them to square, then rainy months have more influence. Practically no monthly rainfall values will be smaller than 1 mm. The improvement consists to calculate this irregularity in terms of irregularity of the vegetative activity. This activity is related to precipitation, but also with the availability of water in the soil and land use. Therefore, we propose a modify Fournier index (MFI) on the effective use of water, which is also closely related to variations in infiltration. Higher and more dense is the presence of vegetation higher is the effective use of water and lower probability of soil erosion.

NDVI has been used as a vegetative index of available vegetative activity. Initial calculations have been done with MODIS satellite data, with an spatial resolution of 500 x 500 m and 8 day composed. The selected area was Cega-Eresma-Adaja subbasin during the period from 2009 to 2017. The calculation of the valid values to eliminate areas with clouds or snow is performed according to the criteria of Martinez-Sotoca et al. (2018). Then, an average of these values was estimated to represent each month of the year.

When MFI and NDVIs is compared with the map of potential soil loss of that area similar patterns and practical equivalence between several classes are found. Therefore, the MFI on NDVI values seems to synthesise the different parameters of the USLE, referring to rainfall, soil, geomorphology and vegetation cover.

Although these results must be compared in several areas, we propose an integrated degradability index easily obtained in time to monitor the evolution of river basins.

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