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Soil Erosion Risk Map based on irregularity of the vegetative activity

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Because of the difficulties to build on both daily rainfall and base shorter time, we explored the possibilities of building indexes based on land cover, which also provide us the opportunity to evaluate their evolution over time. We consider the Fournier index (Fournier, 1960) which is used to assess the rainfall erosivity based on monthly rainfall, alternatively to use of the rainfall intensity in time bases under one hour (eg., van der Knijff et al., 1999; Shamshad et al, 2008).

This index can also be interpreted as an index of irregularity and representing a ratio between maximum monthly precipitation and annual rainfall. We propose 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 reservoir and land use. Therefore, we propose a kind of Fournier index on the effective use of water, which is also closely related to variations in infiltration. Higher is the presence of vegetation higher is the effective use of water.

For this “modified Fourier index” we used the NDVI (Normalized Difference Vegetation Index) as index of available vegetative activity, which is widely reported in the literature (Jensen, 2000). Initial calculations have been done with MODIS 500 x 500 m satellite data. The selected area was Cega-Eresma-Adaja subbasin during the period from 2009 to 2012. We selected 8 days composite images product. The calculation of the valid values to eliminate areas with clouds or snow is performed according to the criteria of Martinez Sotoca (2014), ie with a Saturation (based on HSL color model) greater or equal to 0.15. Then, an average of these values was estimated to represent each month of the year.

The results are very interesting when we compare Modified Fournier Index on NDVIs with the map of potential soil loss. We have found surprisingly similar patterns and practical equivalence between several classes. Therefore, the Modified Fournier Index on NDVI values seems to synthesize the different parameters of the USLE, referring to rainfall, soil, geomorphology and vegetation cover.

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