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Soil and Water: a larger-scale perspective

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1. Data are available from the European Soil Data Centre: http://esdac.jrc.ec.europa.eu/content/rainfall-erosivity-european-union-and-switzerland

Science for Environment Policy

New data on soil erosion by water reveals Mediterranean at highest flood risk

Comprehensive data analysed in a new study show how extensive rainfall can erode soils across the EU and Switzerland, revealing that Mediterranean regions have the highest risk for erosive events and floods. The resulting dataset can also be used for disaster planning and relief.

Rainfall is one of the principle causes of <u>soil</u> erosion. It breaks apart soil, dislodges it from its surroundings, and washes it away as runoff. These mechanisms have an effect on how much water the soil may hold, how fast water flows over the soil, and even on the soil depth. In a much broader sense soil erosion can negatively affect plant growth and agricultural yields, as well as water quality, and recreation.

The erosive force of rainfall can be quantified as 'rainfall erosivity'. In equations estimating soil losses due to water erosion it is termed 'R-factor'. It takes into account the duration, magnitude and intensity of precipitation. Because soil erosion is difficult to document at a large scale, the R-factor is crucial when scientists attempt to model larger areas to test for the possibility of soil loss. However, because a lot of the data on rainfall erosivity are lacking, their models are usually not good predictors.

To try to provide other scientists with better data to use in models, these researchers created a database and maps to better depict rainfall erosivity in Europe. They combined and analysed datasets from across all EU Member States and Switzerland, from a total of 1 541 rainfall monitoring stations¹. To be included in the project, a dataset had to include results taken over a lengthy period of time and have taken recordings very frequently. The average length of collection was approximately 17 years, ranging from seven years to 40. The frequency of recordings occurred at intervals ranging from once every five minutes to once an hour.

The study found that the average R-factor for the EU and Switzerland is some 700 MJ mm $ha^{-1} h^{-1} yr^{-1}$. The higher the R-factor, the greater the risk for soil erosion and the lower the R-factor, the lesser the risk. With values above 1000 MJ mm $ha^{-1} h^{-1} yr^{-1}$, the Mediterranean and Alpine regions feature one of the highest values in Europe, while the Nordic countries have moderate values below 500 MJ mm $ha^{-1} h^{-1} yr^{-1}$.

Dry soils that experience heavy rainfall, even if infrequent, are the most susceptible to erosion. Mediterranean soils match those conditions and were thus found to have a high erosivity density — a measure of erosivity per rainfall. This means the Mediterranean region has the highest <u>risk</u> of erosive events and <u>flooding</u>, yet, at the same time, water scarcity — because of the infrequent but very intense and erosive nature of local rainstorms. On the other hand, wetter areas can also have a high erosivity density and be at risk from landslides and wetland erosion, especially if factors such as soil texture, structure and organic matter content add to their susceptibility.

The comprehensive dataset and maps resulting from this study offer a unique opportunity for further research, the authors say. They suggest this data can be used to plan relief after a flood disaster or plan mitigation techniques by prioritising the areas at highest risk. This information is also useful for assessing landslide and flash flood risk, as well as strategically planning agricultural policies and recovery from forest fires.



