Rainfall Erosivity Database on the European Scale (REDES): A product of a high temporal resolution rainfall data collection in Europe

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The erosive force of rainfall is expressed as rainfall erosivity. Rainfall erosivity considers the rainfall amount and intensity, and is most commonly expressed as the R-factor in the (R)USLE model. The R-factor is calculated from a series of single storm events by multiplying the total storm kinetic energy with the measured maximum 30-minutes rainfall intensity. This estimation requests high temporal resolution (e.g. 30 minutes) rainfall data for sufficiently long time periods (i.e. 20 years) which are not readily available at European scale. The European Commission's Joint Research Centre(JRC) in collaboration with national/regional meteorological services and Environmental Institutions made an extensive data collection of high resolution rainfall data in the 28 Member States of the European Union plus Switzerland in order to estimate rainfall erosivity in Europe. This resulted in the Rainfall Erosivity Database on the European Scale (REDES) which included 1,541 rainfall stations in 2014 and has been updated with 134 additional stations in 2015. The interpolation of those point R-factor values with a Gaussian Process Regression (GPR) model has resulted in the first Rainfall Erosivity map of Europe (*Science of the Total Environment*, **511**, 801-815).

The intra-annual variability of rainfall erosivity is crucial for modelling soil erosion on a monthly and seasonal basis. The monthly feature of rainfall erosivity has been added in 2015 as an advancement of REDES and the respective mean annual R-factor map. Almost 19,000 monthly R-factor values of REDES contributed to the seasonal and monthly assessments of rainfall erosivity in Europe. According to the first results, more than 50% of the total rainfall erosivity in Europe takes place in the period from June to September. The spatial patterns of rainfall erosivity have significant differences between Northern and Southern Europe as summer is the most erosive period in Central and Northern Europe and autumn in the Mediterranean area. This spatio-temporal analysis of rainfall erosivity at European scale is very important for policy makers and farmers for soil conservation, optimization of agricultural land use and natural hazards prediction. REDES is also used in combination with future rainfall data from WorldClim to run climate change scenarios. The projection of REDES combined with climate change scenarios (HADGEM2, RCP4.5) and using a robust geo-statistical model resulted in a 10–20% increase of the R-factor in Europe till 2050.