Geophysical Research Abstracts
Vol. 19, EGU2017-12453, 2017
EGU General Assembly 2017

Modelling soil erosion in rainfed vineyards of northeast of Spain under climate change: effects of increasing rainfall intensity

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This aim of the research was to analyse the effect of rainfall distribution and intensity on soil erosion in vines cultivated in the Mediterranean under the projected climate change scenario. The simulations were done at plot scale using the WEPP model. Climatic data for the period 1996-2014 were obtained from a meteorological station located 6km far from the plot. Soil characteristics such as texture, organic matter content, water retention capacity and infiltration were analysed. Runoff and soil losses were measured at four locations within the plot during 4 years and used to calibrate and validate the model. According to evidences recorded in the area, changes of rainfall intensities of 10 and 20% were considered for different rainfall distributions. The simulations were extended to the predicted changes for 2030, 2050 and 2070 based on the HadGEM2-CC under the Representative Concentration Pathways (RCPs) 8.5 scenario. WEPP model provided a suitable prediction of the seasonal runoff and erosion as simulated relatively well the runoff and erosion of the most important events although some deficiencies were found for those events that produced low runoff. The simulation confirmed the contribution of the extreme events to annual erosion rates in 70%, on average. The model responded to changes in precipitation predicted under a climate change scenario with a decrease of runoff and erosion, and with higher erosion rates for an increase in rainfall intensity. A 10% increase may imply erosion rates up to 22% greater for the scenario 2030, and despite the predicted decrease in precipitation for the scenario 2050, soil losses may be up to 40% greater than at present for some rainfall distributions and intensity rainfall increases of 20%. These findings show the need of considering rainfall intensity as one of the main driven factors when soil erosion rates under climate change are predicted.
Keywords: extreme events, rainfall distribution, runoff, soil losses, wines, WEPP.