Modelling Climate change influence on runoff and soil losses in a rainfed catchment with Mediterranean climate

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The magnitude of erosion processes, widespread throughout the Mediterranean areas, may be enhanced due to changes in seasonal precipitation regimes and an increase of extreme events. The present research shows the results of possible effects of climate change on runoff and soil loss in a rainfed catchment located in the Barcelona province (NE Spain).In the study area, vines are the main land use, cultivated under the Penedès designation of origin. The present research shows the results of runoff and soil loss simulated using SWAT for a small basin with vines as main land use. Input data included detailed soil and land use maps, and daily climate data of the period 1998-2012. The analysis compared simulated results for years with different climatic conditions during that period and the average with predictions for the scenario 2020, 2050 and 2080 based on the HadCM3 GCM under A2 scenario and the trends observed in the area related to maximum rainfall intensity. The model was calibrated and validated using data recorded at different subbasins, using soil water and runoff samples. Taking into account the predicted changes in temperature and precipitation, the model simulated a decrease in soil loss associated with a decrease in runoff, mainly driven by an increase in evapotranspiration. However, the trend in soil losses varied when the changes in precipitation could balance the increase of evapotranspiration and also due to the increase of rainfall intensity. An increase in maximum rainfall intensity in spring and autumn (main rainy seasons) produced significant increases in soil loss: by up to 12% for the 2020 scenario and up to 57% for the 2050 scenario, although high differences may exists depending on rainfall characteristics. The research confirmed the difficulty of predicting future soil loss in this region, which has a very high climate inter-annual variability.