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LandSoil: a model for the analysis of the impact of erosion on agricultural landscape evolution

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The objective of the research presented here was to develop a model (LandSoil: Landscape design for Soil conservation under soil use and climate change) for landscape evolution at a fine spatial resolution scale [1-10 meters] and a long-term temporal scale [10-100 years] aimed at the analysis of agricultural environments.
Working at a catchment scale, the model is based on the Stream soil erosion model. It is spatially distributed, event-based, and considers interrill, rill and tillage erosion as the main processes acting in soil redistribution. The specific characteristics of the model include the use of a detailed representation of the agricultural landscape through parameters such as soil surface properties and hydrologic pathways and considering a climate component based directly on rainfall events.
In this report, we present the characteristics of the model and its application to a Mediterranean study area. The model was subjected to a calibration/validation procedure at field and catchment scales with a long-term data series of runoff and sediment concentration measurements. A number of long-term field and catchment simulations were carried out, allowing us to observe landscape evolution under recent and actual agricultural practises and to formulate hypotheses based on changes related to different agricultural patterns and soil uses. Modelling at a field scale using interrill and tillage erosion simulations on reconstructed ancient topographic surfaces showed a convergence with the present topography (PE <15%, R=0.608). The analysis of a future degraded scenario at the catchment scale indicated a global increase of the soil erosion rate (+29%), with spatial variability depending on the specific soil use type and a significant loss of trapping efficiency by grass strips and vegetated bands at field borders (-81%).