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Assessing the effects of land-use changes on annual average gross erosion

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Abstract. The effects of land-use changes on potential annual gross erosion in the uplands of the Emilia-Romagna administrative region, a broad geographical area of some 22 000 km² in northern-central Italy, have been analysed by application of the Universal Soil Loss Equation (USLE). The presence of an extended mountain chain, particularly subject to soil erosion, makes the estimation of annual gross erosion relevant in defining regional soil-conservation strategies. The USLE, derived empirically for plots, is usually applied at the basin scale. In the present study, the method is implemented in a distributed framework for the hilly and mountainous portion of Emilia-Romagna through a discretisation of the region into elementary square cells. The annual gross erosion is evaluated by combining morphological, pedological and climatic information. The stream network and the tributary area drained by each elementary cell, which are needed for the local application of the USLE, are derived automatically from a Digital Elevation Model (DEM) of grid size 250 x 250 m. The rainfall erosivity factor is evaluated from local estimates of rainfall of six-hour storm duration and two-year return period. The soil erodibility and slope length-steepness factors are derived from digital maps of land use, pedology and geomorphology. Furthermore, historical land-use maps of the district of Bologna (a large portion — 3720 km² — of the area under study), allow the effect of actual land use changes on the soil erosion process to be assessed. The analysis shows the influence of land-use changes on annual gross erosion as well as the increasing vulnerability of upland areas to soil erosion processes during recent decades.

Keywords: USLE, gross erosion, distributed modelling, land use changes, northern-central Italy

▣ [Final Revised Paper](#) (PDF, 1095 KB)

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