



Long-term soil erosion modelling of a cultivated terraced system in the area of Aksum (Ethiopia), with the support of archaeological data

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The evolution of agricultural landscapes is the result of soil redistribution processes caused by water erosion and human activity. Some agricultural areas, well-documented by historical and archaeological data, are useful to understand the evolution of the landscape structures and soil erosion dynamics. This research has been developed in one of the most relevant archaeological areas of East Africa, the site of Aksum (Ethiopia), where the flourishing and decay of the Aksumite Kingdom (400BC–800AD) took place. This site provided favorable conditions for a long-term approach to the study of soil conservation techniques, since such techniques have been maintained from ancient times to the present. In the current study, the surfaces of three terrace systems have been surveyed and analyzed in terms of soil loss, with the plough mark methodology, providing the amount of soil loss within the last two millennia. In this context, we performed long-term modelling for tillage and water erosion with the expert model, LandSoil, which is based on a raster distributed approach and accounts for the principal components in soil erosion-deposition processes. We used both measured and bibliographic soil-climate input data. The results of the simulations, integrating tillage erosion, diffusive erosion and concentrated erosion have been calibrated for long-term soil loss measures based on the plough marks methodology. These results furnished a combination of the main soil physical properties and tillage parameters for the whole simulated period and are compatible with those data reported in the literature. They account for the relative influence of both mechanical and hydrological processes, and confirm the high efficiency of these traditional soil conservation practices.