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A robust evaluation a revised version of the MMF-TWI soil erosion model

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Soil erosion represents a serious challenge for agricultural production and for the environment. Soil erosion impacts, such as reduction of fertile soil, alteration of the carbon cycle and pollution and eutrophication of water bodies, represent a significant management concern. Modelling approaches can deliver indicators on the state of soil erosion impacts and its trends, and scenarios in relation to climate and land use change. This can help define efficient and targeted mitigation strategies. However, to define such strategies, there remains a lack of modelling approaches able to provide with long term baseline information which to measure the success of the mitigation strategies as well as model evaluation approaches robust enough so model results can be trusted by users, including researchers and land managers. The MMF-TWI soil erosion model has demonstrated its ability to simulate soil erosion and the effect of agricultural management practices over centennial scales in humid environments. However, it needs to be revised and evaluated before the model can be applied more widely in other climate areas. In this study, we present a revised version of MMF-TWI incorporating infiltration excess overland flow and a robust and innovative multi-proxy model evaluation approach in an olive orchard catchment in South Spain. The evaluation approach consists of a) the comparison of model simulations with estimations of past soil loss rates obtained from both Pu fallout radionuclide tracers and tree mound measurements and b) the evaluation of the plausibility of the model behaviour by means of global sensitivity analysis.