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Quantifying Holocene erosion and sedimentation dynamics for a Mediterranean semi-arid catchment using LAPSUS

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Erosion and sedimentation processes play an important role in shaping a landscape. In this study, these processes of landscape development are quantified using the landscape evolution model LAPSUS (Landscape Process Modelling at Multi-Dimensions and Scales). LAPSUS is a multi-process model operating on a volume balance basis and includes the following processes: water erosion and deposition, biological and frost weathering, soil creep, solifluction, landsliding, dust deposition and erosion due to tillage. Processes can be inactivated if they are considered to be unimportant. Calibration of the model is done using data from an earlier study conducted in the Torrealvilla catchment, located in the Guadalentín Basin, Murcia, SE Spain. River terrace sediments have been investigated and dated using OSL and radiocarbon methods. Three terrace levels have been identified, showing a Holocene age ranging from $\sim$7.5 ka to modern. With this information, palaeo-DEMs are created and sediment volumes can be calculated for validation of LAPSUS. Furthermore, besides quantification of erosion and sedimentation, we can investigate whether the amounts of erosion and sedimentation calculated for the study area can be simulated using only (natural) water erosion within realistic parameterization or whether other processes, such as erosion by tillage are important. This gives insight in the relative influence of human versus natural activity on erosion processes over time. Another important question is whether average annual rainfall as used by LAPSUS is a suitable parameter for long-term erosion and sedimentation modeling in a semi-arid environment such as our study area in South-east Spain. Alternatively, single low-frequency, high intensity rainfall events might be responsible for a relative large amount of the observed erosion, even over the long term (i.e. 1000s of years). Investigating this can give valuable insight in erosion and sedimentation dynamics in semi-arid environments. Once calibrated for this area, future climate predictions can be evaluated in terms of erosion and sedimentation while also scenarios of e.g. land abandonment or (de)forestation can be evaluated.