



On-slope sediment buffers and complex system response to the introduction of agriculture in a meso-scale catchment in Germany.

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External factors of land use change and climate are the main triggers for soil erosion in humid climates as in Central Europe. In a 340 hectare agricultural catchment near Bonn, Germany, historical soil erosion and land use are reconstructed for the last five centuries. The modeling approaches include a morphometrical model for sediment storage units relevant for soil erosion and a temporal extrapolation of historical land use data. A sediment budget for the catchment is developed based on five different sediment storage types. Temporal resolution is added to the sedimentary archive using OSL and radiocarbon dating methods. The historic geographical archive analysis delivers six land use maps of the catchment for 1430, 1600, 1828, 1893, 1955 and 2000. Despite conceptual implications of this approach that need to be discussed, results are remarkable in the context of internal system dynamics. The data show that the response to significant human influences in terms of sediment dynamics is divided in time and space: On the one hand, the sediment generated by anthropogenic soil erosion is buffered on the slopes, shown by an early onset of significant on-slope colluvial sedimentation. On the other hand, as a consequence of the on-slope buffers, arrival of the sediment signal in the valley bottom appears to be delayed by several centuries. Comparison of the external anthropogenic forcing, as expressed by land use history, and the sediment signal in the fluvial system, yields no remarkable connections, suggesting internal system dynamics rather than a directly tractable external input as the cause.