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Quantifying prediction uncertainties for a simplified semi-distributed soil erosion model that maintains source flow pathways to the stream

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The risk of sediment reaching streams and surface water bodies associated with overland flow, where it can cause pollution, is a combination of a source connecting with a sink. While this has been recognised in the literature, few models explicitly take account of the delivery of material to water bodies and how this relates to the source material. In this paper we present a new approach whereby the sources of material reaching the stream are calculated using semi-distributed functions, enabling delivery maps to be produced of high and low risk areas. We do this by characterising the individual flow pathways using a multi-flow algorithm and using soil and land use information to characterise the source. Sediment is mobilised by using a modified version of the Morgan, Morgan Finney erosion model. The proportion of eroded material is then routed through the landscape and a memory is retained of the contributions of individual pixels to the delivered sediment. We demonstrate this using data from the Petzenkirchen research catchment within a model rejectionist framework that can allow for a quantification of the uncertainties in model structure, parameter uncertainty, prediction uncertainty and errors in observed data.