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Measured and Modeled Rainfall Induced Soil Erosion under Varying Antecedent Soil Moisture Conditions

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The majority of detailed laboratory soil erosion experiments have been done for soil profiles that are near saturation. Hence, tests of mechanistic models for the prediction of rainfall-induced soil erosion have been based on this condition. We studied rainfall-induced soil erosion on a tilting 2 m by 6 m erosion flume under controlled laboratory conditions for different initial soil moisture conditions, rainfall intensities and slopes. Antecedent moisture conditions were found to have a large influence on the total mass of eroded material and especially on peak sediment concentrations. We modified the Hairsine and Rose soil erosion model to allow for infiltration and temporally varying depth of ponding. The modified model is used to explore the relationship between antecedent soil moisture and soil detachability. The model's applicability is assessed by comparison of its predictions with the measured eroded soil (particle size distribution and temporal distribution) at the exit of the experimental flume. We also discuss model parameter uncertainty.