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Development of a flash flood early warning system in agricultural landscapes using high-resolution radar precipitation forecasting data and erosion modeling

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As a result of extreme heavy rain events flash floods and mud flows caused severe devastations of infrastructure and settlements throughout Germany in late spring 2016.
These processes of heavy rain and soil erosion shall be illustrated by a case study of a downhill mud flow near the railway station Schmilka, in the federal province of Saxony, eastern Germany. Thereby, the high-resolution radar precipitation data of the German Meteorological Service (DWD) in 5 minute time steps serve as input data for the process-based soil loss and deposition model EROSION 3D. Model results show a good reproduction of the slope rills with standard model parameters. However, the sediment mass flows in the forest, which was affected by clear cutting, and the deposition of debris and deadwood on the rails can only be achieved with adaption of the model parameters.
These promising results are reflected in high-resolution orthophotos of the erosion event mapped with an unmanned aerial vehicle (UAV).
Future research is focused on the use of high-resolution radar precipitation forecasting data as input for soil erosion modeling and an automatic identification of sediment pass over points. The study will end up with a flash flood early warning system allowing the local authorities to initiate immediate measures in order to prevent severe devastations of infrastructure and settlements.