



Application of physical erosion modelling to derive off-site muddy flood hazard

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Muddy floods are local inundation events after heavy rain storms. They occur inside watersheds before the runoff reaches a river. The sediment is eroded from agricultural fields and transported with the surface runoff into adjacent residential areas. The environment where muddy floods occur is very small scaled. The damages related to muddy floods are caused by the runoff-water (flooded houses and cellars) and the transported sediment that is deposited on infrastructure and private properties.

There are a variety of factors that drive the occurrence of muddy floods. The spatial extend is rather small and the distribution is very heterogeneous. This makes the prediction of the precise locations that are endangered by muddy flooding a challenge. The aim of this investigation is to identify potential hazard areas that might suffer muddy flooding out of modelled soil erosion data.

For the German state of Saxony there is a modelled map of soil erosion and particle transport available. The model applied is EROSION 3D. The spatial resolution is a 20 m raster and the conditions assumed are a 10 year rainfall event on uncovered agricultural soils. A digital landuse map is edified, containing the outer borders of potential risk elements (residential and industrial areas, streets, railroads, etc.) that can be damaged by muddy flooding.

The landuse map is merged with the transported sediment map calculated with EROSION 3D. The result precisely depicts the locations where high amounts of sediments might be transported into urban areas under worst case conditions. This map was validated with observed muddy flood events that proved to coincide very well with areas predicted to have a potentially high sediment input.