

Modelling of urban sediment transport in stormwater runoff on a road catchment near Paris

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In the framework of the French ANR project “Trafipollu”, a recent physically based and spatially distributed numerical model FullSWOF (which stands for Full Shallow Water equations for Overland Flow) (Delestre et al. 2014) was adapted to simulate the urban sediment transport in stormwater runoff on a road catchment near Paris (Le Perreux sur Marne, Val de Marne, France, 2661 m²). The 2D-model uses the Shallow Water equations to calculate water flows and the Hairsine-Rose (H-R) model (Hairsine et Rose 1991) is for the first time applied for urban dust transport. The H-R model is characterized by its capacity to describe separately the sediment detachment processes which are driven by overland flow or raindrops impact. The set-up of FullSWOF is based on centimetric-resolution Digital Elevation Model (DEM) data and tipping-bucket rain gauge records (every 0.1 mm), as well as knowledge on urban sediment data given by granulometric measurements of urban deposits on the catchment. The appropriate ranges of parameter values are investigated using a One-factor-at-A-Time (OAT) method and the simulation outputs are compared to continuous observations of discharge and turbidity at the sewer inlet. The modelling results show that the application of FullSWOF model coupled with high spatial- and temporal-resolution data is a promising approach to reproduce the various dynamics of water flows and sediment transports on the catchment. Meanwhile, the rainfall detachment is approved to be the main process for urban sediment erosion, with the exception of the gutter.