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Modelling daily sediment delivery in meso-scale catchments: LAPSUS-D: a test for temperate climate.

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Soil erosion models have been increasingly sophisticated and advanced in the recent past. Models have become more physically based and suitable for different kinds of situations. However, in their aim to reflect the physical process of erosion as good as possible, the model require large amounts of input data, in many times very temporally dense data, like 10 minute rainfall data, or difficult to obtain soil data such as the saturated conductivity. If such data are unavailable one can only fall back on sediment yield models that produce yearly averages. However, models that estimate yearly averages, ignore a lot of other detailed information, like daily discharge and precipitation data. There are currently no models available that model sediment yield on the temporal scale of one day and the spatial scale of a meso-scale catchment, without making use of very detailed input data.

To fill this scientific and management gap, landscape evolution model LAPSUS (Schoorl, 2002) has been adapted to model sediment yield on a daily basis. This model has the water balance as a base. To allow calibration with the discharge at the outlet, a subsurface flow module has been added to the model. This new version LAPSUS, LAPSUS-D only requires a DEM (10 to 30 m pixel size), a soil map, a land use map, daily discharge and precipitation data and a general idea of the soil depths in the catchment. With this information the model can be calibrated for the water flow part which will give a good indication of the possibilities for sediment transport. LAPSUS-D was tested on catchments with a temperate climate in SW Poland and SE Germany. The model was critically evaluated on the models ability to postdict daily outflow, focusing on peak discharge characteristics. This evaluation showed a satisfactory result for the winter period. In the summer period the convective rainfall was not sufficiently recorded in the catchment, and therefore did not match the outflow. The results show that the model is able to postdict the hydrological behavior of the peak discharges, which is the main determining factor for the generation of sediment outflow.

Keywords: LAPSUS-D, Temperate climate, daily sediment yield modeling, meso-scale catchments, hydrological characteristics, Poland.