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Comparative Calculation of Suspended Sediment Loads with Respect to Hysteresis Effects (in the Petzenkichen Catchment, Austria)

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Streams in intensively used agricultural catchments are frequently characterised by high transport of suspended solids during rainfall events. Due to a high variability in runoff, the sediment concentration relationship during and between different events and various hysteresis effects, instantaneous sediment concentrations and event loads are difficult to calculate. We tested the applicability of turbidity measurements for calculating instantaneous sediment concentrations and loads in a small agricultural catchment in Austria. We calibrated quasi-continuous turbidity measurements using additional water sampling and employed these calibrated sediment concentrations as benchmark sediment concentrations. Four different methods to calculate instantaneous sediment concentrations were tested on 19 events. A generalized rating curve approach resulted in a considerable bias for both event specific sediment concentrations and total sediments loads. Fitting of event specific rating curves still misrepresented instantaneous sediment concentrations for the different events, but gave load estimations that were in a range of 5% of the benchmark values. Two approaches accounting explicitly for hysteresis exhibited the best fit and provided load estimations that were in a range of 0 – 1% deviation to the benchmark sediment concentrations. Nevertheless, several limitations to the hysteresis model approach were identified. Testing the various hysteresis effects against other event parameters such as total rainfall amount, maximum rainfall intensity and initial soil water content revealed interactions to these parameters that could predefine parameter values of the hysteresis model approach.