



Comparison of the ecohydrological models AnnAGNPS and ZIN-AgriTra for a small agricultural catchment

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The ecohydrological models AnnAGNPS and ZIN-AgriTra are compared regarding their performance in a small watershed. Both models are presently applied for the transport simulation of plant protection products (PPP) from an agricultural area to a small stream to quantify the impact of reduction measures as part of a comprehensive study.

The spatial discretization of AnnAGNPS is based on hydrologic response units with homogeneous characteristics (land use, slope and soil type). For the continuous simulations daily time steps are used, only soil moisture is simulated using hourly time steps. The underlying equations are physically based, mostly simple calculation methods are used.

ZIN-AgriTra operates on grid cells, which allows a more accurate representation of the flow paths. The model is physically based, e. g. for the unsaturated soil zone the Richards equation is used. This requires detailed soil properties for its parameterization and leads to small computational time steps (minutes to hours) to fulfil the mass balance requirements. The detailed spatial and temporal scales, as well as the complex equations, result in a long computation time in comparison to AnnAGNPS.

AnnAGNPS and ZIN-AgriTra are compared regarding their accuracy in the water balance and the mass balance simulation. For the mass balance different constituents as e. g. sediment, phosphorus and selected pesticides are simulated.

The study area is located in southern Lower Saxony, Germany. The catchment area has a size of 5 km². The investigated stream (Lahbach) flows along agriculturally cultivated land. The relatively high slopes and the fine soil texture lead to a high fraction of generated discharge (as surface runoff, erosion and rapid interflow) from precipitation events. In the ongoing study the catchment was intensively monitored regarding meteorological and hydrological data. In addition, an event-based monitoring campaign was performed to quantify the reaction of the Lahbach during precipitation events, particularly the change in constituent concentrations. Due to the close cooperation with a local farmer, management measures are known very precisely.

The different temporal resolution of the input data and the time step of output parameters lead to differences in the agreement between measured and simulated time series among the two models. Overall, ZIN-AgriTra led to a more accurate reproduction of the rainfall-runoff events.

