



Impact of past and possible future land use changes on the hydrological behaviour of the Northern German lowland 'Hunte' river

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Changing hydrological behaviour of catchments can be driven by several different influencing factors: e.g., climate change, water management and land use change. While changes in climate and water management directly affect the water cycle by changes in regional forcing (e.g., precipitation, radiation) and local management of surface and subsurface waters, the impact of land use changes on catchment hydrology is much more complex to assess as it results from regionally distributed local changes. Therefore, spatially distributed and process based hydrological catchment models are required for assessing the impacts of spatially distributed land use changes.

The Hunte catchment in Lower Saxony is part of an intensively agriculturally used landscape in Northwest Germany. Pasture and cropland are dominating land uses, while surface sealing increases due to urban sprawl. As the catchment is dominated by agricultural land use mostly, it can be expected that European and national policy as well as the agro-economic development can strongly effect the land use distribution in future. Therefore, in this study, the effect of historical and projected land use changes on the catchment hydrological behaviour is assessed the process based catchment model WASIM-ETH (Schulla). WASIM-ETH has been applied to observed land use data sets (CORINE data) and projected land use scenarios (based on Ewert et al., 2005; Rounsevell et al., 2005) for the mesoscale catchment of the Hunte river in order to quantify the sensitivity with respect to land use change. The results of the study show that historical land use changes have almost no impact on the catchment hydrological processes in Northwest Germany. Simulated water balances and runoff hydrographs are almost identical, driving the model with different input data sets based on the CORINE data set. Differences are small compared to trends identified in the discharge data of the Hunte and Weser rivers. However, in relation to the ability of WASIM-ETH to reproduce the present water flows in the Hunte catchment (model uncertainty), the sensitivity of WASIM-ETH with respect to simulated water flows for the land use scenarios is significant. Therefore, this presentation on the one hand analyses the difficulties of process based hydrological models to reproduce the water flows of intensively used and regulated lowland catchments, but on the other hand also demonstrates the significance of effects of potential future land use changes on regional catchment water balances.

Ewert, F., Rounsevell, M.D.A., Reginster, I., Metzger, M., Leemans, R., 2005. Future scenarios of European agricultural land use. I. Estimating changes in crop productivity. *Agric. Ecosyst. Environ.* 107, 101–116.

Rounsevell, M.D.A., Ewert, F., Reginster, I., Leemans, R., Carter, T.R., 2005. Future scenarios of European agricultural land use. II. Projecting changes in cropland and grassland. *Agric. Ecosyst. Environ.* 107, 117–135.