Geophysical Research Abstracts,
Vol. 11, EGU2009-9866, 2009
EGU General Assembly 2009

Process-orientated simulation of tillage practices and land use change to optimize distributed flood control measures

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Not only climate change affects hydrological systems but also land use change and agricultural tillage practises have an important impact on infiltration and runoff generation. In the last five to six decades monocropping, drainage and rectification of small rivers were carried out to optimize crop yields and economic benefits. However, in recent years more holistic and sustainable management concepts are required. The advantages of ecological management of land, soil and water resources are manifold: the biodiversity is higher, the buffer function of soils will be conserved and both low water and floods are positive affected.
The target of the presented research project which is financed by the Bavarian environment agency, is to establish an optimal flood retention concept in a mesoscale catchment of 150 km^2 which emphasizes ecological flood measures like best tillage practices, small retention basins and renaturation of small rivers. To quantify the effects of these measures the water balance model WaSiM-ETH was used. The grid-based water flow and balance simulation model WaSiM-ETH is a well-established tool for investigating the spatial and temporal variability of hydrological processes in complex river basins. The model can be seen as a reasonable compromise between detailed physical basis and minimum data requirements (http://www.wasim.ch/en/index.html). WaSiM was coupled with a 2d-ground water model and an additional drainage tool. Different vegetation was parameterized with high spatial and temporal resolution. Additionally, future climate scenarios like the extension of vegetation periods were considered. The effectiveness of decentralized retention basins could be simulated by a new implemented see storage tool. The presentation will give quantitative results for different flood control measures. The pros and cons of physically based approaches in hydrological modelling will be discussed.