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# Impact of land use change on hydrological processes and water resources in Benin – from local scale measurements to interdisciplinary scenario modeling on regional scale

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In the past 50 years, West Africa has experienced large land-use changes including deforestation, overgrazing and land reclamation. Land use change may have both immediate and long-lasting impacts on hydrological processes and the local and regional water balance. With the ongoing population growth and socio-economic problems in the region this land use change trend will continue or even aggravate in future. Therefore an assessment of the impact of future land use change on the hydrological process is of utmost importance, especially in combination with climate change impact studies. A prerequisite for this assessment is that the hydrologic processes in the region have to be understood in detail and calibrated and validated models for a scenario analyses are available.
In recent years large progress in assessing land use change impacts on hydrological processes has been achieved with experimental studies and scenario analysis using hydrological models. While the bulk of investigations has been carried out in the temperate climate zones, only few field studies and very few model applications have been performed in the tropical environment. The region of the sub-humid tropical West Africa, has been rarely investigated in terms of hydrological processes and land use change impacts.
In the presented study the impact of land use change on the hydrological processes and the water balance in central Benin (Upper Ouémé catchment) is analyzed using a multiscale approach. First, local scale investigations (field and laboratory investigations, physically-based modeling) were carried out intensively in a well equipped experimental catchment to get a thorough understanding of the hydrological processes in the region. Using the findings a conceptual model (UHP-HRU) was developed and applied on regional scale. The model was validated in catchments with different land use conditions in order to proof its applicably for a land use change scenario analysis. The validated model was used in an interdisciplinary modeling approach in combination with a LUCC-model (CLUE-S) and a regional climate model (REMO). Three socio-economic and two climate scenarios (IPCC SRES scenarios A1B and B1) were simulated.
The results of local scale investigations and regional modeling show that land use has a strong impact on the hydrological processes in the region. With the expected future land use change the surface runoff will increase considerably, locally up to 120 mm/y. This will have a large impact on soil erosion and groundwater recharge in the region.
After a short presentation of the local scale investigations the paper will focus on the results of the land use and climate scenarios on the regional scale. Furthermore a discussion of related uncertainties in the modeling process and the use of these results for water resource management in Benin will be provided.