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Process-based distributed hydrological modelling of annual floods in the Upper Zambezi using the Desert Flood Index

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Wetland areas are especially sensitive to changes in hydrological conditions. The catchment of the Luanginga River, a tributary of the Upper Zambezi which covers about 33000 km^2, shows this characteristic in an exemplary way. Ranging from the Angolan highlands to the Barotse floodplain of the Zambezi River , it is characterized by an annual flow regime and extensive wetland areas. Due to its annual flooding with peak times in April, the area features exceptionally fertile soils with high agricultural production and is further known for its rich cultural heritage, making it especially sensitive to changes of hydrological conditions . To identify possible changes related to projected climate and land management change, especially in the area of the floodplain, there is a need to apply a process-based distributed hydrological model of the annual floods . Remote sensing techniques have shown to be appropriate to identify the extend of the important flooding and were used to validate the model in space and time. The results of this research can be used as a basis with which to provide evidence-based advice and information for all decision-makers and stakeholders in the region.
For this assessment , such a modelling approach is applied to adequately represent hydrological processes and to address key water resources management issues at sub-basin levels. Introducing a wetland simulation extension, the model allows to represent the annual flood regime of the system and thus to address the effect of climate change and upstream land use changes on flow regimes in the downstream watershed. In order to provide a basis for model validation and calibration, the inundated area was determined using the Desert Flood Index (DFI), which was generated from a time series of Landsat images.
We will give a short introduction to the study area and related water resources management problems, present the intended model structure and show first simulations and model validation results using the DFI.