NUMERISCHE ABFLUSSSIMULATION ALS WERKZEUG DER GEOGRAPHISCHEN PRAXIS - AM BEISPIEL DER MODELLIERUNG EINES FLACHSEES IM BIOSPHÄRENRESERVAT PENDJARI (BENIN, WESTAFRIKA)

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SUMMARY

Numerical runoff simulation as instrument of geographical practice exemplified by the model of a shallow floodplain lake in the Pendjari biosphere reserve (Benin, West Africa)

Continuous technological progress allows an increasingly complex mapping of natural phenomena through computer models and offers a wide potential for simulating natural processes and solving applied problems. Whilst well-established in the field of water management, hydrodynamic-numerical methods have so far not received much attention on the part of geographical water balance research. Surprisingly so, since they show considerable advantages. Unlike mere hydrological models, the hydrodynamic-numerical runoff simulation presented in this paper generates both temporally and locally highly resolved information on water levels and flow vectors. This paper gives an overview of the basic principles of hydrodynamic-numerical modelling. Subsequently the different model types and operating procedures are introduced.

To exemplify the three investigation steps, namely preprocessing, processing and postprocessing, a research project is presented, which deals with a water balance question in the semiarid savanna of West Africa. To simulate runoff and inundation scenarios of the river Pendjari and one of its shallow floodplain lakes (mare) in the Pendjari Biosphere Reserve during one rainy season (March to September) a hydrodynamic-numerical model is applied. By analysing monthly water levels and flow vectors it can be shown that the river floods its levees only during extreme flood events. During ordinary rainy seasons the mare is supplied exclusively by precipitation. Given these modelling results, water management measures can now be taken at little cost and with minimal environmental impact.

The paper closes with general conclusions on the use and benefits of hydrodynamic-numerical models in geographical and environmental research and practice.