Geophysical Research Abstracts, Vol. 7, 06921, 2005
SRef-ID: 1607-7962/gra/EGU05-A-06921

Hydrological model upscaling for regionalization of runoff flow and accumulation over the Amma-Niger meso-site

S. Massuel and B. Cappelaere

UMR HydroSciences (IRD-CNRS-UM1-UM2), IRD, BP.64501, 34394 Montpellier cedex 5, France. (massuel@msem.univmontp2.fr)

The hydrological landscape of the Sahelian AMMA-Niger meso-site around Niamey, Rep. of Niger, consists of a mosaic of small endoreic catchments (a few km^2) supplying storm runoff to water accumulation areas, such as ponds and humid spots. A fine-scale, spatially-distributed and physically-based hydrologic model for storm water redistribution over a catchment was developed from a 9-year field record by Cappelaere *et al*. (2003) and Peugeot *et al*. (2003). The work presented here deals with the upscaling of this fine-scale surface water model, to cover the domain of the so-called "KD basin" mesoscale entity ($\sim$6000 km^2) over which a consistent land water cycle analysis, including the aquifer compartment, can be led.

This new, mesoscale surface water redistribution model, named *Zarbhy*, is made of two separate information pre-processors that compile rainfall and land surface characteristics, respectively, and that feed synthetic catchment and storm event descriptors into the core runoff submodel (Massuel *et al*.). The pre-processors transform fine-scale distributions over time and space, from 1-5 min and 20-40 m resolutions into lumped storm-event and catchment variables, respectively, which have been identified as efficient runoff predictors. The rainfall pre-processor filters-aggregates-and-kriges point storm hyetographs from the mesoscale ground raingauge network into a catchment-blocked, scalar spatial field for runoff-prone event rainfall. The land surface preprocessor extracts information from the DEM and land surface maps to synthesize maps of runoff-controlling physiographic catchment descriptors. The core catchment-$\times$-event runoff submodel yields the space-time distribution of runoff volumes contributed to the 377 water accumulating sites identified over the KD basin.

The communication presents the methodology used to develop this model upscaling, together with the performances that have been obtained, against the original fine-scale model. These appear quite acceptable at various time scales, from individual events up to a multi-year sequence, including the seasonal scale at which interactions with the groundwater compartment model are implemented and the land water budget expected. Some preliminary results for the 1992-2003 period are presented.

References:

Cappelaere B., Vieux B.E., Peugeot C., Maia A., Séguis L., 2003. Hydrologic process simulation of a semiarid, endoreic catchment in Sahelian West Niger, Africa. 2. Model calibration and uncertainty characterization. *J. Hydrol*. 279, 244-261.

Massuel S., Cappelaere B., Séguis L.. Upscaling a small-catchment model for surface water regionalization in Sahelian endoreic landscape. *J. Hydrol*., submitted.

Peugeot C., Cappelaere B., Vieux B.E., Séguis L., Maia A., 2003. Hydrologic process simulation of a semiarid, endoreic catchment in Sahelian West Niger, Africa. 1. Model-aided data analysis and screening. *J. Hydrol*. 279, 224-243.