Geophysical Research Abstracts, Vol. 8, 01649, 2006
SRef-ID: 1607-7962/gra/EGU06-A-01649
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Comparison and Evaluation of regional Climate Change Scenarios for Hydrological Studies

A. Bronstert (1), Kolokotronis (2), D. Schwandt (3), H. Straub(2)

(1) Department of Geo-ecology, University of Potsdam, P.O. Box 60 15 53, D -14415 Potsdam, Germany, (2) State Agency for Environment, Measurements and Nature Conservation Baden-Württemberg, P.O. Box 21 07 52, D - 76157 Karlsruhe, Germany, (3) German Federal Institute of Hydrology (BfG) P.O. Box 200253, D - 56002 Koblenz, Germany

The expected climate change is of particular relevance for the hydrological cycle at the regional scale if important water issues, such as flood risk, reservoir management or irrigation schemes are addressed. The climate change may have severe impacts on regional hydrological processes, e.g., evaporation, groundwater recharge, surface runoff, and on the mean and extreme hydrological conditions of a watershed. One crucial question for an assessment of the regional hydrological impacts of climate change is the suitability of climate change scenarios. This contribution analyses the suitability of three different methods of regional climate change scenarios for hydrological applications. Two methods belong to the statistical downscaling approaches, and the third method is a dynamic regional climate model, which is nested into a GCM. The developed evaluation scheme contains two steps. First, the climatic adequateness for hydrologic impact assessment is assessed by checking the capability to represent current climate conditions in space and time, and by assessing the use large scale climate information without introducing too many related uncertainties. Second, the given climatic scenarios are rated regarding their usability for simulation different hydrological processes. This step distinguishes between long-term (mean) water balance components and event scale. The evaluation of the three methods resulted in a different adequateness of these scenarios, depending on the hydrological process under question. In general, processes which are governed by temperature conditions (e.g. evaporation, snow melt) are evaluated “better” then the processes governed by precipitation characteristics (e.g. runoff generation, floods). The investigated methods are of very limited meaning for or extreme hydrological conditions.