Geophysical Research Abstracts, Vol. 9, 07588, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-07588


# Validation of simulated lake level dynamics of a global hydrological model

**A. Güntner** (1), F. Hacker (1), S. Werth (1), M. Hunger (2), P. Döll (2) and L. Menzel (3)

(1) GeoForschungsZentrum Potsdam (GFZ), Germany, Section Engineering Hydrology, (2) Department of Physical Geography, University of Frankfurt a.M., Germany, (3) Centre of Environmental Systems Research, University of Kassel, Germany, (guentner@gfz-potsdam.de/Fax: +49 331 2881570)

Large lakes and reservoirs are an important component of the hydrological cycle of river basins. Lake level dynamics contribute to temporal variations in continental water storage as observed by the GRACE satellite mission. However, there are only few attempts to represent lakes in global hydrological models and to evaluate modelling results of lake level variations at large scales. In this study, lake level simulations of the WaterGAP Global Hydrology Model (WGHM) are compared to observed time series for most of the 200 largest lakes worldwide. Observed lake level time series were collected from satellite radar altimetry (data sets published by LEGOS, USDA and ESA), public data bases of in-situ gauge measurements, and from other publications. For lake simulations in WGHM, their position in the continental drainage network with 0.5 degree resolution is based on a Global Lake and Wetland Data Base (GLWD). A simple conceptual approach is applied to calculate the water balance of lakes in WGHM, assuming a cone-shaped storage geometry to determine the water level-volume relationship for each lake, a rectangular weir–based outflow formula, and human consumptive water use. The WGHM simulation period covers the years 1901 to 2006. The comparison to observed water level dynamics shows that model performance varies considerably between the lakes. While for most lakes seasonal dynamics are represented, the absolute annual range of water level variations tends to be underestimated. Simulated inter-annual or decadal variations only partly agree with the observations. Compared to natural lakes, man-made reservoirs are characterized by lower model performance. This is presumably due to disregarding reservoir operation schemes in the model. A main reason for poor model performance in terms of lake level variations are deficiencies in simulated river discharge used as lake inflow, while modifications of the water balance modelling approach have a comparatively small effect only. The analyses show the need for extended lake level and river discharge data sets at lake inflow and outflow river stretches to close lake water balances and adequately modify surface water storage simulations in hydrological models.