Geophysical Research Abstracts, Vol. 8, 00456, 2006
SRef-ID: 1607-7962/gra/EGU06-A-00456

Investigating the Ability of the Land Surface Model SWAP to Simulate Water and Energy Budget Components from Catchment to Global Scales

O.N. Nasonova, Ye.M. Gusev and Ye.E. Kovalev
Institute of Water Problems, Russian Academy of Sciences, Moscow, Russia
(nasonova@aqua.laser.ru / Fax: (7-495) 1355415 / Phone: (7-495) 1357271)

The land surface model SWAP represents a physically based model describing the processes of heat and water exchange within a soil-vegetation/snow cover-atmosphere system (SVAS). The model can be applied both for point (or grid cell) simulations of vertical fluxes and state variables of SVAS in atmospheric science applications and for simulating streamflow on different scales - from small catchments to continental scale river basins. In the case of a small catchment, to simulate runoff at the catchment outlet a kinematic wave equation is used. In the case of large river basins, the area is divided into calculational grid cells connected with a river network, runoff is modelled for each cell and than transformed by river routing model to simulate streamflow at the river basin outlet. During the last 10 years different versions of the model SWAP were validated against observations including characteristics both related to energy balance or thermal regime of SVAS (sensible and latent heat fluxes, ground heat flux, net radiation, upward longwave and shortwave radiation, surface temperature, soil freezing and thawing depths) and related to hydrological cycle or water regime of SVAS (surface and total runoff from a catchment, river discharge, soil water storage in different layers, evapotranspiration, snow evaporation, intercepted precipitation, water table depth, snow density, snow depth and snow water equivalent, water yield of snow cover). The validations were performed for "point" experimental sites and for catchments and river basins of different areas (from 10^{-1} to 10^5 km^2) on a long-term basis and under different natural conditions (from arid to humid and from non-frozen soils to permafrost). The results of validation have shown that SWAP is able to reproduce annual and interannual dynamics of the mentioned characteristics fairly well. This allowed us to

apply the model for simulating heat and water balance components on global and continental scales using global 1-degree data sets, suggested within the framework of the international project GSWP-2. Following the GSWP-2 strategy, we used a number of alternative global forcing data sets to perform different sensitivity experiments (in particular, with six alternative versions of global precipitation and four versions of global radiation). The results of simulation of different heat and water balance components using alternative data sets were compared with literature data to reveal the capability of the model to capture spatial patterns of simulated variables and intercompared to reveal the impact of uncertainties in forcing data on the final results.