Geophysical Research Abstracts,
Vol. 10, EGU2008-A-03126, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-03126
EGU General Assembly 2008

Coupling Satellite and Ground-Based Snow Data With Physically Based Model of Runoff Generation for Long-Range Forecasting Snowmelt Floods

L.S. Kuchment (1), P. Romanov (2), A.N. Gelfan (1), V.N. Demidov (1), D. Tarpley (3)

(1) Water Problem Institute of Russian Academy of Sciences, Moscow, Russia, (2) University of Maryland, College Park, MD, USA, (3) NOAA Office of Research and Applications, Silver Spring, Maryland, USA

Improvement of long-range forecasts of snowmelt floods is one of key hydrological problems in the coniferous forest zone of Russia (part of NEESPI area), however existing network of snow measurements is very sparse and application of satellite data for snow monitoring is hampered by large areas of coniferous forests masking the snow pack and by persistent cloudiness in the fall and winter season. In the Water Problems Institute (WPI) of Russian Academy of Sciences, a distributed physically based model has been constructed which is based on the finite-element schematization of river basin and describes the main runoff generation processes (snow cover formation and snowmelt, freezing and thawing of soil, vertical soil moisture transfer and infiltration, overland, subsurface and channel flow). An experience of using this model for hydrological forecasting for several river basins, including the Vyatka River basin, has been accumulated. In order to enhance quantitative characterization of snowpack properties we have developed a new technique where satellite data are coupled with the WPI-snowpack model. The snowpack model uses interpolated data from ground-based meteorological stations and incorporates a number of products derived from Moderate Resolution Imaging Spectroradiometer (MODIS) onboard Terra and Aqua satellites. The input satellite data include albedo, land surface temperature, leaf area index, and the canopy coverage. The outputs of the model are the snow depth, snow density, ice and liquid water content of snow and the snow grain size. The snow-

pack model was tested over a region which includes the Vyatka River basin with the catchment area of about 120 000 km2. Snow pack simulations were conducted for 1 x 1 km grid cells for the spring season of 2002 and 2003 and the modeled snow extent was appeared to be in good correspondence with the MODIS-derived snow cover distribution over the study area. Land surface and satellite data for 2002-2003 seasonss were used for prediction and forecast of snowmelt flood hydrographs. Satisfactory agreement between the modeled and observed hydrographs was obtained.