Geophysical Research Abstracts
Vol. 13, EGU2011-13460, 2011
EGU General Assembly 2011

Comparison of two approaches to simulate soil water dynamics in the permafrost landscapes

Lyudmila Lebedeva (1) and Olga Semenova (2)

(1) St.Petersburg State University, Dept. of Geography and Geoecology, 31/33 10-ya liniya V.O., 199178, St.Petersburg, Russia , (2) State Hydrological Institute, Department of Experimental Hydrology and Modelling of Hydrological Processes, St. Petersburg, Russia (omakarieva@gmail.com)

Although the process of water infiltration into the frozen or thawing ground in different permafrost landscapes has been studied extensively it still remains very difficult to be parameterized in hydrological models significantly affecting the results of runoff simulations. The objective of current research was to compare the robustness and effectiveness of two different approaches describing this process embedded in two hydrological models.

The Hydrograph model (developed in Russia) uses layer-by-layer approach to calculate water infiltration into the frozen ground. It is based on water-balance relationship where soil properties such as maximum water holding capacity, porosity and infiltration coefficient play the critical role. Simultaneously the heat dynamics calculations of soil stratum are conducted allowing for the account of solid and liquid moisture ratio and its affect on infiltration rates.

The Canadian Cold Regions Hydrological Modelling Platform (CRHM) uses the approach which groups frozen soils into the three classes according to their surface entry condition: Unlimited infiltration, Restricted, and Limited. For Limited type of soils (which are of higher interest) infiltration is estimated using empirical equation from surface saturation, initial soil saturation, initial soil temperature, and infiltration opportunity time.

Two approaches were tested at the research sites of Russia (Kolyma water balance station), Canada (Wolf Creek watershed) and Alaska, the US (Ivotuk, Kougarok and Council sites) located in the zone of continuous or discontinuous permafrost. The results of simulations compared to observed data using both approaches would be presented discussing their advantages and disadvantages.