Geophysical Research Abstracts
Vol. 15, EGU2013-939-2, 2013
EGU General Assembly 2013

Assessment of possible climate change impacts on large-scale mountainous permafrost basin by two hydrological models

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The impact of the climatic regime variability on water resources in permafrost regions is not enough studied. Understanding of hydrological response to observed or projected climate change is important for selection of optimal development and adaptation strategy for regions with rich natural recourses like the Eastern Siberia.
The main goal of the study is assessment of possible climate change impact on hydrological regime of the Upper Lena River based on application of two hydrological models: Russian and Japanese ones. The additional output of the research is the evaluation of applicability of used hydrological models in impact assessment studies. The upstream of the Lena River basin (440 000 sq. km at Krestovsky station) originate at north slopes of the Baikal Range. Major part of the basin is covered by permafrost. It has snow-dominated regime of runoff generation.
Two distributed hydrological models are applied in the study: the model of the Jamanashi University (YHyM, Japan) and the Hydrograph model (Hydrograph Model Research Group, Russia). The YHyM is based on the digital elevation model and generates fluxes in every grid. Opposed to the Hydrograph model, it does not account for permafrost condition and distribution of underground water. The Hydrograph model describes all essential processes of the land hydrological cycle and includes coupled algorithm of heat and water dynamics in soil that allowing for adequate representation of runoff formation processes in permafrost environments.
The study was conducted following its main stages: deriving and preparation of the ensembles of meteorological data from CMIP5 projections, evaluation of projected climate changes for the studied territory, running hydrological models with historical forcing and evaluation their applicability to present the processes, running hydrological models with projected meteorological forcing in 2020-2100 perspective, and assessment of hydrological regime changes. The hydrological responses to different climatic input generated by YHyM and Hydrograph models together with detailed analysis of the models' applicability for impact studies in permafrost condition will be presented.