



Response of Lena basin river runoff to recent and projected global climate warming

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During last several decades significant climate warming has been observed in the permafrost regions of Eastern Siberia. Observed environmental changes include increasing air temperature and to a lesser degree precipitation. Changes in regional climate are accompanied by changes in river runoff. Over the past 25-30 years the phase of increase of annual and seasonal river runoff is observed on the main tributaries of the Lena River. Comparison of intraannual changes of river runoff in Lena river basin for the examined periods (before 1980-th and beginning with 1981) shows that: 1) in downstream of Lena river the most noticeable increase of river runoff occurs in cold part of year while in parts of basin upper confluences of Aldan river and Vilyui river changes river runoff intraannual distribution are more homogeneous and are less significant; 2) the most noticeable increase of the Lena River runoff in cold part of the year is observed below of the confluence of the Aldan River and Vilyui river; 3) considerable increase of river runoff in low part of Vilyui river in many respects can be connected to its artificial regulation as result of dam construction; 4) in downstream gages of right-bank tributaries of upstream and middle stream of Lena river (Vitim, Olekma) changes of intraannual river runoff distribution are less noticeable and are more homogeneously distributed within year.

According to the results of hydrological modeling the expected anthropogenic climate warming in the first third part of XXI century can bring river runoff increase in the Lena river basin as compared with the recent one. Hydrological responses to climate warming have been evaluated for the plain part of the Lena river basin basing on a macroscale hydrological model featuring simplified description of processes developed in Institute of Geography of the Russian Academy of Sciences (Georgiadi, Milyukova, 2000, 2002, 2006, 2010 etc). As the climate scenario is used a range of possible climate change, which is calculated based on the results of numerical estimates for deviations of climatic elements from their recent values carried out on ensemble of 10 global climate models, originating from two contrasting scenarios of globally averaged air temperature changes (A2 and B1) included in the program of last experiment 20C3M-20th Century Climate in Coupled Models, held in the framework of the Intergovernmental Panel on Climate Change (IPCC) and selected on the basis of comparison of observed and model present-day climate (Kislov et al., 2008). According to the scenario estimations in central plain part of Lena river basin during the first third part of this century it is possible to expect increase of mean annual river runoff (3-6 %) and compact transformation of flood wave by its redistribution for earlier terms.