



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

Alexander Georgiadi, Irina Milyukova, and Ekaterina Kashutina

Institute of Geography RAS, Moscow, Russia (galex50@gmail.com/495 9590033)

It follows from the results of calculations fulfilled that in the period of intensive warming of regional climate (beginning with the 1980s) the average annual air temperature rose very considerably, but heterogeneously over the territory of the Lena River basin. The most significant rise is observed in central, eastern and southern parts of the basin. The character of change of annual precipitation is going on in this period less homogeneously over the basin's territory.

Over the past 20 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 XXI century can bring more significant 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. Two atmosphere-ocean global circulation models included in the IPCC (ECHAM4/OPY3 and GFDL-R30) were used as scenarios of future global climate.

The both scenarios suggest quite a significant change in the character of the annual stream-flow distribution in middle of XXI. The scenarios give, in essence, the similar pattern of changes in the wave of spring-summer high water. The onset of the flood can be shifted one month backward, as compared with the current situation.

The main contribution to the river runoff change in the mid-21st century can be made by the increase in atmospheric precipitation and air temperature, while the scenario changes in the active layer depth are not to make a perceptible impact.