Climate anomalies and tendencies of change in Lake Baikal basin

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The summer of 2015 was characterized by extremely high temperatures and an extreme precipitation deficit in the Lake Baikal basin. These climate extremes are displayed on the background of corresponding long-term positive trends for temperature and negative trends for precipitation during the last decades (http://meteorf.ru/). The Lake Baikal basin is among Russian regions with the strongest warming in summer during the last decades. Such regional climate trends should cause negative trends of the water balance in the Lake Baikal basin.

Figure 1 shows the relationship between anomalies of precipitation and surface air temperature in summer for the Lake Baikal basin from the ERA-Interim reanalysis data for the period 1979-2015. There is a significant negative correlation (coefficient of correlation -0.62). According to the corresponding linear regression, precipitation is decreasing by 12% for the 1K temperature increase. The estimates are similar to those obtained for mid-latitudinal Eurasian regions from meteorological observations for spring-summer months since the 19th century [1].

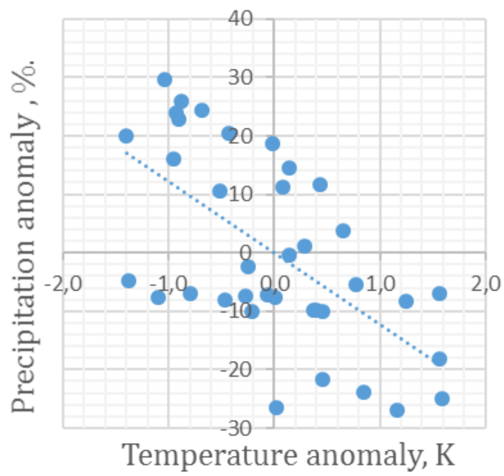

Fig. 1. Relationship between anomalies of precipitation and surface air temperature in summer for the Lake Baikal basin from the ERA-Interim reanalysis data for the period 1979-2015.

The estimated long-term tendency is accompanied by strong interannual variability affected by various climate processes with blocking anticyclones formation and effects of quasi-cyclic El Niño phenomena. In particular, the year 2015 was the year of the El Niño formation and large positive surface temperature anomalies in the eastern and central Pacific Ocean on the equator. The El Niño effects with significant influence on the global surface temperature are manifested in Russian regions. According to [2], there was a high risk of high temperatures and drought conditions in spring-summer 2015 for the Asian mid-latitude regions of Russia in association with the El Niño event.

Figure 2 shows wavelet coherence between precipitation in June-September over the Lake Baikal basin and El Niño index (Niño3.4) in January for the period 1979-2015. According to Fig. 2 there is a significant coherence on interannual and interdecadal time scales during the last decades.

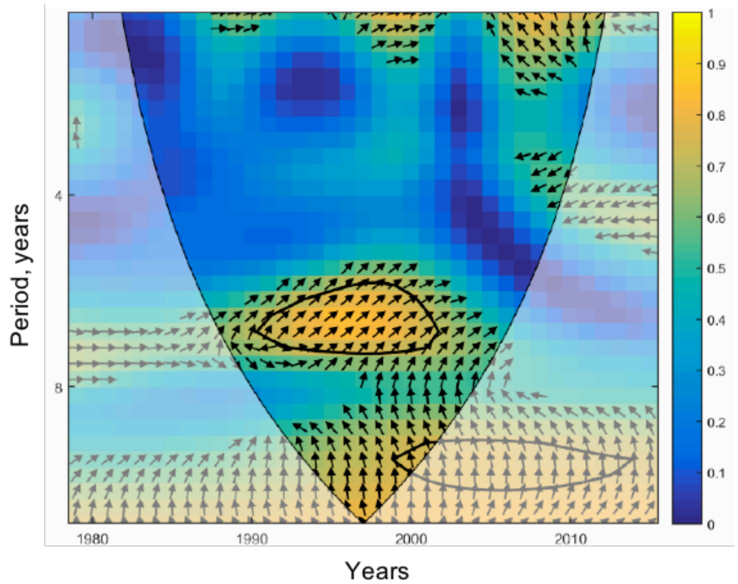

Fig. 2. Wavelet coherence between precipitation in June-September over the Lake Baikal basin and El Niño index (Niño3.4) in January for the period 1979-2015.

Hydrometeorological changes in the Baikal Lake basin are related to its specific longitudinal and latitudinal position. According to model estimates we have to expect a general tendency of decrease for summer precipitation in mid-latitudinal Russian regions under global warming (except for the Far East and the Amur River basin) [3-5]. Multi-model simulations show a general runoff reduction in summer for the Yenisei, Ob and Volga River basins. This tendency is reinforced from west to east with a maximum decrease in summer runoff in the Yenisei River basin including the Angara River and Lake Baikal basins. Further to the east to the Lena and Amur River basins as a whole is shown the growth of summer runoff. Such changes can be related with the monsoon activity in the Far East.

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