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Sea level change under the global warming (the basins of the Black Sea and the Caspian Sea as a case study)

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The studying of the hydrological cycle changes under natural and anthropogenic forcing is an important goal of the physical climatology. There are two independent methods of research: atmospheric circulation models and empirical data. In frame of the empirical approaches can be used both the data of observations and paleoclimatic reconstructions.

Attention to the water resources changes under the effect of global warming has grown for the last decades. The mean global air temperature has already grown to 0.6 ^{0}C since the end of 19^{th} century and according to forecasts of climate change the global temperature is expected to be 1˚C above the pre-industrial value by 2010 and 2˚C by 2025 (IPCC, 1995, 2001).

Three warm periods have been studied: the Holocene climatic optimum (6.2 – 5.3 KA B.P.), the warming of 1930-es and the last three decades of the 20^{th} century, that are accompanied by the global warming and the growth of the Caspian Sea level, in order to research ranges of the Sea level fluctuations.

The peculiarity of regional climate changes has been examined for all seasons in 1990s with an extra high increase in the mean global air temperature. The temperature and precipitation anomalies have been compared for 1991-2000 and the Holocene optimum. It has been concluded that quantitative estimates of the air temperature and precipitation agree between themselves for the larger regions of Eurasia. It means that the climatic optimum of the Holocene should be used for the near future climate scenario as well as for assessment of the Seas level change.

The paleoclimatic reconstruction-maps for winter and summer air temperature and

annual precipitation for global warming on 1˚Ñ have been used as predicting scenarios of climate conditions in the beginning of 21 century.

Based on the heat-water balance method and scenario a hydrological model has been developed to calculate the changes in climate and hydrological parameters with the progress of global warming. This model allows to calculate changes in annual runoff and evaporation for the Caspian Sea and The Black Sea catchments. Some additional assumptions have been made to adapt this method for scenarios of climate change.

The water balance approach and method of historical analogy (using instrumental data of the Seas water balance components) have been used for the assessment of the Caspian Sea level with global warming on 1^0C.