



## **Complex analysis of changes in the water regime of the rivers of European Russia based on the methods of automatic hydrograph separation (GrWat package)**

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The assessment of the water regime transformation is one of the most urgent tasks in modern hydrology. Over the past 30 years significant changes in the interconnection between the phases of the water regime, the mechanisms of their influence on each other, associated mainly with the change in the processes of runoff formation have been detected. Most likely, this is due to the changes in the temperature-humidity regime of large geographic regions, caused by the global climate dynamics. At the moment, it is quite difficult to analyze simultaneously the shifts in rates and indicators of all phases of the hydrological year.

The main goal of this work is the separation of the genetic components of the runoff on the basis of grapho-analytical methods as well as comprehensive analysis of water regime indicators. For this purpose, a program Gr Wat for automatic hydrograph separation was developed. It based on a joint analysis of the daily data of water discharge, and averaged (by basin territory) values of the air temperature and precipitation. As initial information data on water discharge at 35 gauging stations within the European part of Russia were used. NOAA Cires reanalyse was used as the initial meteorological information. The result of the program's operation is a set of time-series of 54 parameters of the water regime.

According to the results, in recent decades, all the indicators of the minimum runoff, which reflect the the underground component of river nourishment, have increased noticeably on the most number of the rivers. There is also a significant reduction in volume of main flood wave and maximum water discharge associated with an increase in infiltration losses, which in turn is due to a decrease in the depth of freezing of the soil. These trends are most pronounced in the north-west and in the center of European Russia. The least changes affected the north-east and east of the region.

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