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Estimations of the periodic regularities in time series of water runoff of Neman River for its long range forecasting

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Neman River is one of the largest rivers in Europe. Its length is equal to 937 km. Neman has origin in the Minsk Upland, Belarus, and flows west through a broad, swampy basin. It then turns north and passing through the territories of Lithuania and Russia discharge its water into the Baltic Sea.

The discontinuous time series (TS) of Neman River runoff are available from 1859. Observations are made near Smalininkai, Lithuania. The runoff of the river is chaotic and significantly variable. Its minimum of 1969 was equal to 11,2 km³/year, while the maximum of 1916 approaches the value of 25,2 km³/year. So, the diapason of the changes of the annual runoff of Neman River is equal to 14 km³/year.

The variation of runoff of Neman River impacts to different branches of modern economy, such as fishery, water transport and tourism, industrial and communal water consumption.

The development of the methodology of analysis of TS of Neman River runoff, revealing their regularities for long range forecasting are actual research and practical tasks closely related with the problems of development of the regional economy and integrated water resources management. Long range forecasts should account the hidden periodicities in runoff dynamics.

The present study is aimed for the development of the method of periodicities for the analysis, modeling and forecasting of TS of Neman River runoff. Annual time series were analyzed and modeled in the time interval from the beginning of instrumental observations up to 1995, the training forecasts for 1996 – 2005, and for the intervals of 1996 – 2000 and 2001 – 2005, were computed and tested by the new data. The forecast computed by the method of periodicities was compared with the mean value forecast.

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Key Words: time series analysis, river runoff, periodicities, forecast

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