



Ice regime of Russian Arctic rivers during the current climate base period

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The geographical position of the Russian Arctic (territories northward from the 60° N) contributes to the formation of a large number of rivers on its territory. Various ice phenomena form on them for at least 5 months annually. River systems have been playing a significant role in the development of the Russian Arctic. The ice regime of rivers contributes to these processes on the one hand and interferes with the other. On the positive side, ice cover is used for building ice roads and bridges during the winter period. On the negative side frazil pans drift, ice drift, aulices in pipes and ice jams cause significant damage and can lead to human victims. Ice formation and river break-up processes are determined with both hydrological and meteorological factors, such as river hydraulics and water flow as hydrological and air temperature with the amount of precipitation as meteorological ones. River ice regime is enough sensible for considerable climate changes in the Arctic. The aim of our investigation is to show modern ice regime of rivers of the Russian Arctic during the current climate base period.

The ice events data were received from 184 hydrological stations. We analyzed averages of ice regime characteristics. Observations were controlled for each station with statistical tests: Mann-Whitney U-test and Spearman rank correlation to avoid statistical errors. Maps of modern ice regime were created.

Current ice events duration period is long, from 181 days in Karjala to 250 days in Chukotka peninsula and 260 days in Taimyr peninsula. The ice cover period is also long, from 160 to 260 days from Karjala on the west to Chukotka peninsula on the east and Taimyr peninsula on the north. A freezing period is from the middle of September in the east to the beginning of November in the west. Ice cleaning period is from the end of April to the middle of July.

It is shown that on the territory of the Arctic zone of Russia, there is a softening of the ice regime of the rivers, manifested in the reduction of the period with ice events for 10-13 days in the western part of the territory and 2-4 days in the eastern one, as well as ice cover period duration, will also decrease. Ice events on the rivers of the Arctic zone can be observed over long periods of time - from 5 to 9 months.

It is shown that the duration of freezing and cleaning periods, in this case, has multidirectional tendencies: the freezing period is reduced by 0-2 days in the east and 3-5 days in the west of the territory, and the duration of ice cleaning in some regions increases by 1-2 days, in another reduced by the same time. Over most of the territory, there is an increase in variations of the ice regime characteristics of the rivers, which increases the risk of their early or late onset.

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