

Analysis and prediction of hazardous hydrometeorological phenomena in the coastal areas of the Arctic

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Currently, the Arctic is attracting increased attention not only as a region with the most noticeable climate change, but also as a world mineral storage, whose development prospects are being actively discussed. For Russia, which owns the bulk of the Arctic shelf, the Arctic is also a promising trade and transport artery, as in recent decades new opportunities for using the Northern Sea Route have been discovered. But climate change can lead to less favorable consequences. The increase in the ice-free sea surface enhances the role of wind waves in the Arctic basin, which threatens platforms for the extraction of hydrocarbons on the continental shelf, vessels navigating the Northern Sea Route or its sections, as well as onshore structures, including by increasing the rate of erosion shore. Reducing the duration of the ice season activates the dynamics of ice, increasing its hummocking, and, as a result, the effect of drifting formations drifting to the ice in the ice fields increases. The development of important economic sectors in the difficult climatic conditions of the Arctic is impossible without the development of reliable systems for forecasting regional changes in weather and climate. The main objective of the work is to analyze changes in wind-wave conditions and mesoscale atmospheric processes in the coastal regions of the Russian Arctic in recent decades and forecast their dynamics under conditions of a decrease in the ice extent of the Arctic Ocean. Unique archives of satellite and hydrometeorological data, reanalysis data, climatic, regional and wind-wave models are used. The main goal of the work is to improve the accuracy of regional forecasts of hazardous hydrometeorological phenomena in the polar regions based on the development of integrated monitoring technology for mesoscale atmospheric processes in the coastal zones of the Arctic seas of the Russian Federation based on a joint analysis of ground and satellite observations and mathematical modeling results. Most of the work's tasks - namely, the development of forecasting systems for leeward storms, mesoscale cyclones, assessment of the risks of their occurrence in the context of modern climate changes, are being solved for the first time. Currently, the Arctic is attracting increased attention not only as a region with the most noticeable climate change, but also as a world mineral storage, whose development prospects are being actively discussed. For Russia, which owns the bulk of the Arctic shelf, the Arctic is also a promising trade and transport artery, as in recent decades new opportunities for using the Northern Sea Route have been discovered. But climate change can lead to less favorable consequences. The increase in the ice-free sea surface enhances the role of wind waves in the Arctic basin, which threatens platforms for the extraction of hydrocarbons on the continental shelf, vessels navigating the Northern Sea Route or its sections, as well as onshore structures, including by increasing the rate of erosion shore. Reducing the duration of the ice season activates the dynamics of ice, increasing its hummocking, and, as a result, the effect of drifting formations drifting to the ice in the ice fields increases. The development of important economic sectors in the difficult climatic conditions of the Arctic is impossible without the development of reliable systems for forecasting regional changes in weather and climate. The main objective of the work is to analyze changes in wind-wave conditions and mesoscale atmospheric processes in the coastal regions of the Russian Arctic in recent decades and forecast their dynamics under conditions of a decrease in the ice extent of the Arctic Ocean. Unique archives of satellite and hydrometeorological data, reanalysis data, climatic, regional and wind-wave models are used. The main goal of the work is to improve the accuracy of regional forecasts of hazardous hydrometeorological phenomena in the polar regions based on the development of integrated monitoring technology for mesoscale atmospheric processes in the coastal

zones of the Arctic seas of the Russian Federation based on a joint analysis of ground and satellite observations and mathematical modeling results. Most of the work's tasks - namely, the development of forecasting systems for leeward storms, mesoscale cyclones, assessment of the risks of their occurrence in the context of modern climate changes, are being solved for the first time.

The figure shows the linear trend of the average for December-February wind speed (m / s / year) in different regions of the Arctic according to the CFSR data from 1979 to 2017. Gray indicates significant trends.

Keywords: Arctic climate, wind-wave-ice interaction, polar low

