



## **Numerical Modelling of Extreme Natural Hazards in the Russian Seas**

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Storm surges and extreme waves are severe natural sea hazards. Due to the almost complete lack of natural observations of these phenomena in the Russian seas (Caspian, Black, Azov, Baltic, White, Barents, Okhotsk, Kara), especially about their formation, development and destruction, they have been studied using numerical simulation. To calculate the parameters of wind waves for the seas listed above, except the Barents Sea, the spectral model SWAN was applied. For the Barents and Kara seas we used WAVEWATCH III model. Formation and development of storm surges were studied using ADCIRC model. The input data for models - bottom topography, wind, atmospheric pressure and ice cover. In modeling of surges in the White and Barents seas tidal level fluctuations were used. They have been calculated from 16 harmonic constant obtained from global atlas tides FES2004. Wind, atmospheric pressure and ice cover was taken from the NCEP/NCAR reanalysis for the period from 1948 to 2010, and NCEP/CFSR reanalysis for the period from 1979 to 2015. In modeling we used both regular and unstructured grid. The wave climate of the Caspian, Black, Azov, Baltic and White seas was obtained. Also the extreme wave height possible once in 100 years has been calculated. The statistics of storm surges for the White, Barents and Azov Seas were evaluated. The contribution of wind and atmospheric pressure in the formation of surges was estimated. The technique of climatic forecast frequency of storm synoptic situations was developed and applied for every sea. The research was carried out with financial support of the RFBR (grant 16-08-00829).