



## Long-term variability of extreme waves in the Caspian, Black, Azov and Baltic Seas

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In order to study extreme storm waves in the Caspian, Black, Azov and Baltic Sea we used the spectral wave model SWAN. Significant wave height, swell and sea height, direction of propagation, their length and period were calculated with the NCEP/NCAR ( $1,9^\circ \times 1,9^\circ$ , 4-daily) reanalysis wind forcing from 1948 to 2010 in the Caspian, Black and Baltic Seas and with the NCEP/CFSR ( $0,3^\circ \times 0,3^\circ$ , 1 hour) for the period from 1979 to 2010 in the Azov Sea. The calculations were performed on supercomputers of Lomonosov Moscow State University (MSU). The spatial resolution of the numerical grid was of order 5 km for the Caspian, Baltic and Black Seas, 2 km for the Azov Sea. These model wave hindcasts were used to calculate interannual and seasonal variability of the storm frequency, location and duration. The Initial Distribution Method and Annual Maxima Series Methods were used to study probable waves of a century reoccurrence. The long-term variability of extreme waves revealed different trends in the investigated seas. The Caspian and Azov seas decreased the storm activity, while in the Baltic Sea the number of storm cases increased and the Black Sea showed no significant trend. The of more than 12 m were observed in two centers in the middle part of the Caspian Sea and in the center of the Baltic Sea. In the Black Sea the extreme waves of the same probability of more than 14 m were found in the region to the south of the Crimean peninsula. In the Azov Sea the highest waves of a century reoccurrence do not exceed 5 m. The work was done in Natural Risk Assessment Laboratory, MSU under contract G.34.31.0007.