

Waves in the marine area near Cape Svobodny (south-eastern part of Sakhalin Island)

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Abstract. A study of wave processes near Cape Svobodny on the south-eastern coast of the island Sakhalin using autonomous wave recorders and a weather station has been performed. Analysis of five-month data of sea level and temperature, atmospheric pressure and wind speed revealed that there are no significant peaks for wind and infragravity (IG) waves in the wave period range 2–600 s, and the wave energy is lower at the point protected by Cape Svobodny. During storms, there is an increase in the energy of IG waves. Waves detected at periods of 14.2 seconds, 3.62 minutes, and 8.85 minutes are related to swell and edge waves propagating seaward. For explanation of short waves, the Longuet-Higgins and Stewart theory was used which describes the dispersion of swell in the surf zone and the formation of free waves. Edge waves were analyzed using the Lamb model and the Bessel function of the first kind of zero order. Modelling of wave processes propagating shoreward revealed the presence of IG waves with periods of 20–110 seconds and edge waves with periods of 4.27–7.63 minutes, confirmed by the dispersion relation for Stokes waves on a sloping bottom. Sea water temperature fluctuations of more than 7 °C with periods of 3–100 minutes affect the propagation of waves with periods longer than 3 minutes, destroying the edge and leaky waves. Analysis of wind wave characteristics showed no significant wave processes, including wind waves, in the 2–20 second period range. The maximum wave height was observed during prolonged southern winds associated with a cyclone. This study is important for understanding wave processes in this area, aiding in predicting their behaviour and impact on the coastline.

Keywords:

wind waves, edge waves, leaky waves, infragravity waves, swell, internal waves

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