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Features of sea level and atmospheric pressure fluctuations on the eastern shelf of Sakhalin Island

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Abstract. The results of an analysis of sea level and atmospheric pressure fluctuations based on observations conducted over 12.5 days with one-minute intervals from the jack-up drilling rig Sakhalinskaya, which is installed on the eastern shelf of Sakhalin Island in the Nyysky Bay area at a depth of 25–30 m, are presented. Measurements were made using a digital cable system equipped with piezo-quartz pressure sensors. Spectral analysis of sea level variations revealed pronounced peaks at periods close to the diurnal and semidiurnal tidal harmonics, as well as low-frequency maxima interpreted as manifestations of shelf seiches and seiches of Nyysky Bay. It was shown that infragravity waves were recorded within the minute-range periods, some of which may transform into edge waves propagating along the coast. The analysis of atmospheric pressure fluctuations revealed spectral maxima in the range from several minutes to tens of minutes, which can be associated with internal gravity waves and acoustic–gravity waves in the atmosphere. During stormy periods, wave activity intensified, and an almost continuous spectrum with a distinct mode structure was formed. It was established that the spectral density slope of atmospheric pressure fluctuations in the considered period range is close to the power of –1/3, which differs from previously published results and is explained by the fact that the analyzed periods occur within the range of energy input to the lower atmosphere.

Keywords:
sea level fluctuations, atmospheric pressure, tidal harmonics, shelf seiches, infragravity waves, edge waves, acoustic-gravity waves

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