Preliminary seismic hazard assessment of the Arctic Gakkel ridge and surrounding

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Abstract This study describes primary data, methods of estimation and final results of the preliminary seismic hazard assessment in the region of the Gakkel Ridge that is a northernmost seismogenic zone of the Earth. According to geological data, the region is considered potentially oil and gas, but its industrial development has not yet begun. These authors for the Baltic Sea did the similar work earlier. At the first stage of this study, the earthquake catalog unified in magnitude Mw was compiled for the period from 1912 to 2014. Information on seismic events from historical sources and the ISC catalog was used, as well as the results of observations of the Arkhangelsk seismic network in the Arctic for 2014–2018. The representative part of earthquake data was revealed and the seismic regime has been studied. By seismicity origin, the region is divided into the highly active rift zone of the Gakkel Ridge and the continental slopes of the Barents, Kara and eastern Laptev seas with weaker activity, separated and framed by aseismic areas like the Nansen, Amundsen basins and the Lomonosov Ridge. The seismic zoning of the study region was carried out based on structural analysis of geological and geophysical data. The mapping of probabilistic seismic hazard in terms of maximum accelerations of PGA soil movements for a return period of 500 and 100 years (10% probability of exceedance in the next 50 and 10 years) was conducted using the CRISIS program. As expected, the most dangerous was the Gakkel zone about 200 km wide.

Keywords Arctic, seismicity, earthquake, recurrence, structural analysis of geological and geophysical data, seismic zoning, seismic hazard, CRISIS program, attenuation.

For citation Assinovskaya, B.A., Panas, N.M., Ovsov, M.K., & Antonovskaya, G.N. (2019). [Preliminary seismic hazard assessment of the Arctic Gakkel Ridge region and surrounding]. *Rossiiskii seismologicheskii zhurnal* [Russian Seismological Journal], *1*(1), 35-45, (In Russ.). doi: *https://doi.org/10.35540/2686-7907.2019.1.03*

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