EGU21-7830, updated on 18 Jun 2021
https://doi.org/10.5194/egusphere-egu21-7830
EGU General Assembly 2021

Approach to study the seismicity in the Perunica Glacier, Livingston Island, Antarctica

Gergana Georgieva[1], Liliya Dimitrova[2], and Dragomir Dragomirov[1]
[1]Sofia University, Faculty of Physics, Meteorology and Geophysics, Sofia, Bulgaria (ggeorgieva@phys.uni-sofia.bg, drago.n.dragomirov@gmail.com)
[2]National Institute of Geophysics, Geodesy and Geography, Bulgarian Academy of Sciences, Acad. G. Bonchev Str., Bl. 3 1113 Sofia, Bulgaria (lidim@geophys.bas.bg)

The seismicity caused by the movement of glaciers was discovered only 30-40 years ago, and it was initially assumed that only glaciers in Greenland create this type of seismicity. Today, a significant part of the earthquakes registered by the Antarctic seismic stations are of glacial origin. In recent years, scientists' interest in studying the seismic activity of glaciers and its relationship to various environmental factors has increased due to the response of the ice mass to climate change.

The interest of studying seismicity of Antarctica has increased in the last decade with installation of a growing number of seismic stations in the region.

In 2015, with the first installation of the LIVV seismic station, Bulgarian seismologists began studying the seismicity of the Perunika Glacier, located on Livingston Island, Antarctica. Between 2015 and 2018, seismic recordings were made only in the astral summer, and from January 2020 the seismic station was installed for year-round operation. The seismic station is located near the glacier.

In this study, an approach to analyze the ice generated events recorded during all working period of the LIVV station is presented. Depending on the source mechanism and therefore the different waveform shapes, several types of icequakes and earthquakes are distinguished.

Registered icequakes are more than 16000. Its duration varies between less than a second and more than a minute. A few events are several minutes long. We have noticed that from 2015 to 2020, the number of glacier events is increasing while its duration is decreasing.

Localization of the ice generated events with duration below 1 s is calculated. In the localization procedure, a velocity model developed for the area of the seismic station is applied. The produced icequake epicenters are grouped in several clusters within the Perunika glacier. The nature of these glacier events are still studying.

Another approach to study the seismic activity of the glacier is carried out by estimating the ambient seismic noise. Frequent and spectral distribution of the power of seismic noise is made

over the seismic data recorded during all working periods. It is concluded that the noise sources in the periods around 0.5 s are linked to the dynamic processes in the Perunika Glacier. Some relationship between the change in the noise power in the 0.2-0.6s period band and tidal cycles has been found.

Acknowledgment: The presented study is supported by project: No 70.25-171/22.11.2019 “Study the activity of the Perunika glacier during year-round deployment” funded by the National Center for Polar Studies, Bulgaria.