System of complex geophysical observations in the active fault zone of South Sakhalin

Kostylev D. (1, 2), Kamenev P. (1)

(1) Institute of Marine Geology and Geophysics, Far East Branch, Russian Academy of Sciences, Yuzhno-Sakhalinsk, Russia

(2) Sakhalin Branch, Geophysical Survey, Russian Academy of Sciences, Yuzhno-Sakhalinsk, Russia

e-mail: predont@yandex.ru

To conduct complex geophysical observations in the area of the Central-Sakhalin fault and seismic monitoring of the Aniva gas field, an experimental site has been created in the village of Petropavlovskoye (Aniva district, Sakhalin region). The ambient noise level was estimated and seismic surveys were performed at the geophysical equipment installation sites.

To monitor the seismic process, molecular-electronic and mechanical velocimeters were installed at the site. A comparative analysis of the technical characteristics of seismometers is carried out and their combined use is justified.

The seismic monitoring system of the southern part of the Central Sakhalin Fault was supplemented by a group of observation points of the Petropavlovskoye site: Taranai and Korsakov. Observation points form a triangle with distances from 20 to 30 km from each other, which allows you to record local events in the study area with a confident determination of their epicentry.

An analysis of the registration capabilities of seismic equipment showed that the choice of location for the site was justified for monitoring. The ambient noise level at the registration point is low and, combined with the use of standard filters used to identify events, did not make it difficult to determine the arrival of various types of waves. At the moment, the first results have been obtained confirming the specified capabilities of the installed equipment, which allows, together with the network of seismic stations of the SB GS RAS, to record seismic events in the Aniva gas field with a representativeness of $M \geq 1.0$.

The hydroacoustic part of the site observation system contains two molecular-electronic hydrophones with a bandwidth of 0.02–200 Hz and a sensitivity of 1.5 mV / Pa. Hydrophones are installed in a flooded well and in an open shallow water. The results of field hydroacoustic observations of weak earthquakes in the area of the Central-Sakhalin fault were obtained. The characteristics of the recorded acoustic emission signals from earthquakes perceived by hydrophone stations (frequency spectrum, arrival times of seismic waves) were investigated.

In the immediate vicinity of the seismically active areas of South Sakhalin, a network of three sites for monitoring subsoil radon was deployed. The manifestation of seismic activity of adjacent seismogenic regions is reflected in the dynamics of the radon volumetric activity in the air of the subsoil. After running in the equipment and installing additional items, it is planned to use radon monitoring data as an additional parameter to substantiate conclusions about possible scenarios.

All the above-mentioned approaches to conducting complex monitoring in the zone of the Central-Sakhalin fault should allow expanding the possibilities of studying local seismicity, as well as the methods of medium-term forecasts of strong earthquakes. In addition to solving fundamental issues, a developed observation network can also be successfully applied to solving applied problems, such as observations of induced seismicity processes in the Aniva gas field.