

# Optimization of seismic networks by results of an estimation seismic noise conditions in Far East of Russian Federation

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Today active exploration of continental shelf with aim of oil and gas extraction has place in Far East Region of Russian Federation. It can be attributed to such projects Sakhalin -1, Sakhalin -2 and Sakhalin -5. Pumping of hydrocarbons (oil production) in the seismically dangerous region, like the Far East of Russia, change tension in earth's crust. This process can lead to increase of the seismic activity and, as consequence, to earthquakes. Seismic activity can cause pipe destruction, by which raw material is transferred, destruction coast complexes of processing and accordingly can lead to the ecological catastrophe.

It is necessary to establish the network of seismic stations and to conduct seismic monitoring for purposes of warning situation described above. It is necessary to arrange stations so as to fix largest possible number of events in the zone of interest for obtaining maximally complete information about the seismic regime of region.

The optimum network of seismic stations for North Sakhalin was calculated and was determined its threshold sensitivity. All infrastructural requirements for setting of stations were taken into consideration in this work.

The measurements of noise in different points of North Sakhalin: Odoptu-1, Odoptu-2, Chayvo, Nogliki, Sabo, Okha, Tymovskoe were carried out at first. The same measurements were carried out also at the seismic station in Yuzhno - Sakhalinsk, these data were used for the comparative characteristic of seismic noise.

Let us name the minimum magnitude  $M_L$  of earthquake, which can be registered by station at a distance 50 km as threshold magnitude of the recorded earthquake. We determine these magnitudes for all points according to the results of the noise measurements level. The minimum values of magnitude threshold on the north of Sakhalin correspond to point Sabo ( $M_L$  0.5) and  $M_L$  0.6 corresponds to point Tymovskoe. The maximum value of magnitude threshold belongs to point Chayvo ( $M_L$  2.2), where the most intensive construction work is conducted. The average value of threshold magnitude on all stations was  $M_L$  1.56. This value was used for primary estimation of the

dimensions of zone, in which the registration will be produced by network without any omissions.

As a result of work there were given the best positions for seismic stations installation on the north of Sakhalin with the best conditions of registration and of the infrastructural requirements, which are necessary for guaranteeing the effective seismic monitoring in the region. There were shown zones, in which will be recorded the weakest seismic events (zone of the overlap of the greatest quantity of stations). It is taken into account, that it is better to place the station on the rocks, and the best places for the maintenance stations were selected:

1. Mnogovershinny (mainland part of the Far East);
2. Okha (north of Sakhalin, where the seismic station of the Sakhalin branch of geophysical service RAN [Russian Academy of Science] is located);
3. Rybnovsk (north of Sakhalin);
4. Nikolayevsk-na-Amure (mainland part of the Far East, where the seismic station of the Sakhalin branch of geophysical survey RAS [Russian Academy of Science] is located).

It was build the map, on which are shown the zones of the overlap of seismic stations for different threshold magnitude  $M_L$  of earthquakes and zone of the reliable registration of seismic events.