Seismoacoustical signatures of inverse seismoelectric effect of 2nd type during electric soundings of geomediun in Central Sakhalin fault zone

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The purpose of the experiment on crust electric sounding using new current sources is as follows. The direct and inverse seismoelectric effects have already been sufficiently investigated on scales from meters to the first hundreds of meters. Based on them, methods of seismic-electric exploration of the crust have been developed, allowing to outline oil and gas fields. Vibrators (direct effect) or electric current sources (inverse effect) are used. The current in the primary dipole usually does not exceed 1-2 A, when electric sounding are carried out on this scale. Geophysical experiments using powerful current sources (MHD generators, electric pulse generator units) allowed to reveal the effect of a seismic response to electric sounding, which can also be attributed to the inverse seismoelectric effect on scales of tens or hundreds km. For a better understanding of the patterns of the inverse seismoelectric effect, information about the reaction of the geomedia to the electrical effect on an intermediate scale – hundreds of meters – the first kms may be useful. The presentation gives the results of such an experiment, which was conducted in 2021 at the Petropavlovsk mini-landfill (Anivsky district, Sakhalin Island). As a source of electrical impulses, a semiconductor current switch developed at IMGG FEB RAS for currents up to 40 A, withstanding a voltage of up to 800 V in the closed state. During electric sounding, current pulses were supplied to a primary dipole about 400 m length, which was located on the eastern side of the Central Sakhalin fault. Four sounding sessions were conducted, one per calendar day. Each session included a series of 100 current pulses of 5-7 A amplitude and a duration of 20 s, the inter-current pause was 20-40 s. In the experiment, on November 15, 16 and 18, 2021, the soundings were carried out during the period that falls on astronomical noon (around 13:40 local time, UTC+11). On November 17, the experiment took place just before the astronomical midnight. A molecular broadband seismometer and a molecular electronic hydrophone installed near one of the poles were used to record seismic acoustic signals. In addition, seismic noise was recorded at the local seismic stations of the Sakhalin branch of the FITC EGS RAS. The following main results have been obtained. Due to waveforms records from the hydrophone, periods with a series of current pulses are distinguished, the amplitude of seismoacoustic signals increasing. The spectral-time analysis of signals from the hydrophone also indicates the reaction of the medium to electric soundings. The changes are manifested in the form of an increase in the spectral density in the frequency bands 4.3 Hz (+/- 0.2 Hz) and 12.5 Hz (+/- 0.2 Hz). Variations of microseismic noise during the period of electric sounding and thereafter were also recorded by the stations "Ogonki"(OGK) and "Ozhidaevo"(OJD) of the network of the Sakhalin branch of the FITC EGS RAS. However, one cannot associate them with electrical action due to cyclones resulting in baric variations and, hence, considerable increase in the microseismic noise.