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**A. L. Shepetov[1], T. Kh. Sadykov[2], K. M. Mukashev[3], V. V. Zhukov[4], L. I. Vil'danova[4], N. M. Salikhov[5], A. D. Muradov[3], A. Kh. Argynova[2]**

[1]P. N. Lebedev Physical Institute of the Russian Academy of Sciences (LPI), Moscow, Russia,
[2]Institute for Physics and Technology, Almaty, Kazakhstan,
[3]Al-Farabi Kazakh National University, Almaty, Kazakhstan,
[4]Tien-Shan Mountain Research Station. Kazakhstan, Almaty, Kazakhstan,
[5]Institute of Ionosphere JSC "National Centre Research and Technology", Almaty, Kazakhstan.

# SEISMIC SIGNAL REGISTRATION WITH AN ACOUSTIC DETECTOR AT THE TIEN SHAN MOUNTAIN STATION

**Abstract.** The program of future development of the scientific detector complex at Tien Shan mountain cosmic ray station anticipates the creation of a system of high-sensitive microphones for registration of elastic disturbances of seismic origin in the acoustic frequency range. Synchronous operation of acoustic detector together with a widespread system of the cosmic rayparticles detectors permits to test the hypothesis on the possibility of microcrack creation in the deep seismic active regions of Earth's crustunder the influence of penetrative particles (the muons) which originateas a result of cosmic ray interaction with the atmosphere. The disturbance ofelastic oscillations which arise by the opening of microcrack propagatesas an acoustic wave within the mass of lithosphere and can be detectednear its surface as a momentary increase of acoustic noise. It is supposed that registration of such oscillations in correlation with passage moments of energetic cosmic ray particles can be a perspective earthquake forecast method in seismically active regions of the Earth. In this work, we discussthe design principles and possibilities of an acoustic detector which isbuilt on the basis of a high-sensitive microphone installed in a drilledhole, at the depth of 50 m from the surface, and is presently operating atTien Shan station. We present the results of the test acoustic signal registration which was held at the end of2017. The consideredinvestigation can be of a large importance for solving the problem of along-term earthquake forecast.

**Key words:** acoustic detector, cosmic rays, muon components, elastic seismic oscillations, synchronous recording.

**Introduction.** An actual problem of modern seismology is the long-term forecast of the level of seismic activity, in particular, of powerful earthquakes, in the seismically dangerous regions of the Earth. At present time the seismological science experiences a crisis which is connected both with the shortages of the existing theory of earthquake development and with the lack of any reliable method of earthquake forecast [1]. In fact, a multitude of methods which are applied now for prediction of the level of seismic activity such as the measurement of electric conductivity of the medium, the measurements of the deformation field and of the movement speed of different lithosphere regions, the measurements of the natural radioactivity level and the intensity of local neutron background, and the like [2, 3] are based on various physical phenomena which take place in the vicinity to the surface of the Earth's crust. Same shortages such as an extreme unreliability of the forecast and a poor reproducibility of the results gained are typical for the most part of these methods. These drawbacks are caused by the fact that the observable surface effects cannot be always unambiguously connected with an earthquake preparation in a certain region of the Earth.

Still, an open question of traditional seismology is the selection from an overwhelming information stream which comes from different seismological sensors of some distinctive signal on the approaching of a definite catastrophic earthquake with a strict forecast localization in the time and space. Usually, such a signal is lost irrecoverably against the steady background of small and non-dangerous earthquakes, and amongst the fluctuations of the large-scale geodynamics processes. Because of these obstacles, any plain signal of an earthquake preparation usually can be found only post factum.