GC2024-SG062

Study of the wave pattern of various nature events from the area of the Novaya Zemlya Test Site according to historical seismic and infrasound records by Central Asia stations

Inna N. Sokolova[1] , Irina L. Aristova[2] , Darkhan K. Komekbayev[2]

[1] Unified Geophysical Service of the Russian Academy of Sciences
[2] Institute of Geophysical Research NNC RK

sokolovain@gsras.ru

The northern Novaya Zemlya Test Site was used during Soviet times to conduct unique nuclear weapons tests in different environments. So for the period 1955-1990, 130 nuclear explosions were carried out at the Test Site, the total yield of which was 265 megatons. On Novaya Zemlya, 1 ground explosion, 85 air, 2 surface, 3 underwater and 39 underground (in boreholes, adits) nuclear explosions were carried out. In addition, tectonic earthquakes occur near the Test Site as well as induced earthquakes caused by multi-megaton underground nuclear explosions.

Unfortunately, only a small number of seismic events from the Test Site was recorded by digital stations. However, over the years of the Test Site operation, the archives of various seismological organizations of the former USSR have accumulated a large number of analogue seismograms from permanent and temporary stations.

On the territory of the Kazakh SSR, instrumental seismic observations began in 1927 (AAA stations); by the beginning of the the Test Site operation, a large number of sensitive seismic stations were operating in Central Asia. Historical seismograms of nuclear explosions and earthquakes from the territory of the Novaya Zemlya Test Site were digitized over a number of years by the Complex Seismological Expedition of the Institute of the Physics of the Earth of the Russian Academy of Sciences, and by the Institute of Geophysical Research of the Republic of Kazakhstan; a database of digitized records of events with epicenters at the Novaya Zemlya region was created, it contains more than 700 seismograms at epicentral distances from 1270 to 4390 km. It includes seismic records of atmospheric and underground nuclear explosions, as well as underwater nuclear tests, tectonic earthquakes and aftershocks of nuclear explosions. In addition, infrasound records of waves from multi-megaton atmospheric nuclear explosions recorded by a microbarograph installed at the Talgar seismic station at a distance of approximately 3600 km from the Test Site were studied.

The kinematic and dynamic parameters of records of nuclear explosions carried out in different environments (in the air, under water and underground) were studied using digitized records of events conducted at the Novaya Zemlya Test Site, the characteristic features of the wave pattern of each class of events were found.

Records of anthropogenic earthquakes of the 1970s, as well as seismograms of tectonic earthquakes occurred on August 1, 1986, and October 11, 2010 were analyzed by Kazakhstan stations data.

The conducted work is important for the development of methods for recognizing the nature of seismic sources, as well as estimating explosion parameters using seismic data.