Seismic phenomena associated with the eruption of a volcano in the area of the Tonga archipelago on January 15, 2022

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Seismic phenomena on Earth are determined by many complexly interrelated endogenous and exogenous processes occurring, in particular, as a result of volcanic activity. On January 15, 2022, a volcano erupted in the Tonga archipelago, accompanied by acoustic disturbances in the atmosphere, the electric and magnetic fields of the Earth. The study of changes in the seismic process associated with the eruption and the evaluation of the energy parameters and structure of the wave field from seismic data is the subject of this work. The catalogue of earthquakes of the International Seismological Centre and the seismograms of the Data Management Centre of the IRIS corporation were used as initial data. The analysis of the catalogue showed that as a result of the eruption, seismic activity was activated, namely: out of 145 earthquakes in January 2022, 134 earthquakes occurred after the eruption and only 11 before the eruption. The earthquake sources after the eruption are located on an area of about 6183 km^2 and a depth of less than 10 km. The analysis of seismograms recorded by broadband channels (BH, VH) of the global observing system makes it possible to visually identify a number of seismic disturbances. First of all, these are surface waves from Rayleigh with an average oscillation period of 23 s, well traced at distances up to 100 degrees. The group velocity of Rayleigh waves is 3.6-3.8 km/sec. The magnitude calculated from them at stations mainly with oceanic propagation paths is Ms $\sim$ 5.52 (according to USGS data at a larger number of stations, Ms $\sim$ 5.8), and the corresponding seismic energy using known empirical dependencies was about Ec=(1-7)x10^{13} J, and the scalar seismic moment Mo=2.4x10^{17} J. For seismic energy, a similar result was also obtained in the calculation using the full record of Rayleigh waves. For example, at the YSS station (Ussuriysk, distance 77 degrees) the seismic energy estimate is Ec=2.5x10^{13} J. On seismic channels with a frequency band from 0.0003 to 0.1 Hz, two other types of vibrations were found at a number of stations. For the first one, the disturbance propagation velocity measured at 6 stations lies in the range of 0.28–0.37 km/sec with a characteristic period of 400 s. This type of disturbance is associated with the gravitational response of a seismometer to an acoustic disturbance in the atmosphere. For the second type of seismic disturbances, the propagation velocity is 0.21–0.26 km/sec with characteristic periods of 550 s on the horizontal components of geophones. This type of seismic disturbances is probably due to the tsunami wave and its splash on the coast.