

TO THE SUBJECT OF SEISMIC HAZARD IN WESTERN KAZAKHSTAN

N.N. Mikhailova, A.I. Nedelkov, I.N. Sokolova, G.S. Sultanova

Institute of Geophysical Research NNC RK, Kurchatov, Kazakhstan

In recent years, the question of seismic activity in Western Kazakhstan is actively discussed especially due to possible man-caused seismicity resulting from hydrocarbons recovery in this region. However, in fact, the question on both natural and man-caused seismicity in region is still open. Until recently, reliable information about registered earthquakes in region confirmed by instrumental data of observation stations were absent as well as reliable catalogues of registered events.

Usually, during seismic hazard estimation in intensity parameters or peak accelerations calculation is made from focal connected with tectonic structures located outside of Kazakhstan, for instance, Kapetdag-Caucasia-Crimea rupture zone traversing the Caspian Sea from Turkmenistan to Azerbaijan. This zone is characterized by permanent high seismic activity. Its eastern part experienced one of the largest earthquakes on Eurasian continent – Krasnovodskoye earthquake (08.07.1885r.) with $M=8,2$. On the territory of Kazakhstan it was felt with intensity of 6 on the MSK scale.

According to data of the Institute of Seismology MES, two main seismogenerating zones: south-Embensk and Central-Ustyursk were revealed on the territory of Western Kazakhstan in Caspian Sea region. Unfortunately, there are no instrumental seismic data about earthquakes in these zones that could serve as main evidence in favor of their modern tectonic activity.

The present work task is to find information about natural or man-caused earthquakes occurred in investigated region using data of global seismic networks and regional data of NNC RK stations. The following information was used:

- global seismic monitoring results contained and systematized in different international catalogues and bulletins including ISC, NEIC, REB, GS RAS;
- data of new seismic array of international monitoring – Akbulak, data of International Monitoring System CTBTO AS-059 Aktyubinsk station, records of Russian stations, Turkmenistan stations and other from IRIS/DMC archive;
- information about availability of quarry industrial blasts on the investigated territory.

According to data of global observational networks, there are registered seismic events within Kazakhstan and nearby borders from the year 1968 to 2000. Total, 27 earthquakes with $M=3,4-4,7$ were included into primary catalogue. Detailed analysis of each event allowed dividing all events into two groups. First group contains events that are considered as invalid. Second group contains earthquakes of high location probability on the investigated territory or nearby, for instance, in western part of Aral Sea region on the territory of Uzbekistan, northward of Caspian Sea and in other regions. Records of Kislovodsk, Arty, Alibek and other stations were acquired for its authentication. Tectonic position analysis of these earthquakes was conducted. Conclusions about connection of revealed earthquakes with tectonic structures of investigated area were made.

After the year 2000 NNC RK observational seismic stations network was enlarged and improved. Especially great possibilities were opened after setting into exploitation Akbulak seismic array in 2004. The station is very sensitive to both regional and teleseismic events. It registers about 800 seismic events per year in Western Kazakhstan and adjacent territories of Russia, Uzbekistan and Turkmenistan. Detailed analysis of registered signals waveforms with focal in western Kazakhstan and South Ural showed that major part of events are the quarry blasts. Data of Aktyubinsk infrasound station were used to identify the events nature. Western Aral Sea region is subjected to seismic activity, two earthquakes were revealed in western part of

Northern Kazakhstan. However, there are no modern instrumental confirmations of seismicity on the Kazakhstan territory of Caspian Sea.

From the end of 2005 monitoring of this territory is conducted by two Kazakhstan facilities of International Monitoring System – three component borehole Aktyubinsk station and Akbulak seismic array. According to data of these stations there are no earthquakes with magnitude more than 3,0 (mpv) so far.

Installation of one more high sensitive station in the west of Kazakhstan (Caspian Sea region) is desirable to reduce energy threshold of registered earthquakes and increase location accuracy. Only actual data about modern seismicity could clarify the question on seismicity in Western Kazakhstan. However, it is clear that other tectonic (seismogenerating) zones revealed using global seismic data and confirmed by results of regional monitoring in addition to Kopetdag-Caucas should participate in calculation of effects on Western Kazakhstan facilities.