Industrial and natural-industrial earthquakes at platform regions of Kazakhstan

Sokolova I.N., Mikhailova N.N., Poleshko N.N., Velikanov A.E.

Institute of geophysical research of the Ministry of Energy of the Republic of Kazakhstan, Almaty, Kazakhstan

e-mail: sokolova@kndc.kz

Starting from 1994, a monitoring network of the RSE IGR consisting mainly of sensitive seismic arrays of different configuration has been operating on the territory of Kazakhstan. Monitoring of Kazakhstan seismicity has revealed some earthquakes occurred at regions that traditionally were considered as aseismic. A range of earthquakes was related to the places of active industrial effect, mainly on the territory near quarries that conduct regularly powerful explosions, and at oil fields.

The report shows information about events of industrial and induced nature occurred on the territory of Kazakhstan. The industrial earthquakes at hard rock deposits (Zhezkazgan deposit and Zhomart quarry in Central Kazakhstan, gold ore quarries of Northern Kazakhstan), at raw hydrocarbon deposits (Tengiz oil field, Zhanazhol gas condensate field), at former Semipalatinsk Test Site were investigated, as well as natural-industrial (induced) earthquakes (in Central and West Kazakhstan). The nature of such earthquakes appearance can be different: at hard rocks deposits it is dynamic manifestation of rock pressure that results in rock collapse, rock bursts. At oil and gas fields the industrial earthquakes are, as rule, due to decrease of formation pressure in oil strata, and at the regions of underground nuclear explosions conducting (UNE) – with cavities collapse formed after explosions. Also, near large active quarries there could appear natural-industrial earthquakes with origins related to active faults (region of iron ore production, Rudniy town, region of coal quarries, Karaganda city, Lake Shalkar etc.). Some earthquakes were with magnitude more than 5, and intensity 6 and higher. The analysis of historical seismicity showed that such earthquakes started to occur recently.

Despite large amount of industrial events recorded by the IGR network, these do not reflect the whole pattern of geodynamic activity at the regions of intensive industrial effect, as in general the reference magnitude mpva for the whole Kazakhstan territory by the permanent network of seismic observations is 3.0 – 3.5. It is necessary to conduct permanent monitoring by special networks of seismic observations at regions of large hard rock deposits, oil and gas fields, and the STS, as large earthquakes at such regions are dangerous not only by huge number of victims, destructions and economic loss, but by probably serious ecologic consequences.