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Isolation of variations of thermal neutrons intensity of lithospheric origin for the diagnostics and forecast of earthquakes

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Method for isolating changes in the intensity of thermal and slow neutrons of lithospheric origin in the background variations caused by solar and atmospheric sources of disturbances is proposed. The method is promising for the diagnostics and forecast of earthquakes in seismic active regions. The method is based on the results of synchronous measurements with high statistical accuracy of variations in the intensity of thermal and high-energy neutrons in various cosmophysical and geophysical conditions, including seismic activity, during 10 years. Installations are located close to the fault of the earth′s crust at the high-altitude station of cosmic rays (3340 m above sea level, 43.02 N, 76.56 E, 20 km from Almaty) in the mountains of Northern Tien-Shan. Almaty is surrounded by a number of potential sources of strong earthquakes. Therefore the problem of a forecast of earthquakes always will be actual for this megapolis.
Analysis of the measurement results during the effective solar and geophysical events (atmospheric pressure variations, coronal mass ejections) confirmed the genetic connection of thermal neutrons near the Earth's surface with high-energy neutrons of galactic origin and allowed to conclude about unified sources of disturbances of their fluxes in the absence of seismic activity. Analysis of experimental data during the activation of seismic activity in the vicinity of Almaty showed the frequent breakdown of the correlation between the intensity of thermal and high-energy neutrons and the absence of similarity between variations during these periods. The cause of this phenomenon is the additional thermal neutron flux of the lithospheric origin, which appears under these conditions. Simple statistical data manipulation makes it possible to exclude variations of interplanetary and atmospheric origin in the intensity of thermal neutrons and to isolate changes caused by the activation of seismic processes.
We used this method for analysis of variations of thermal neutrons intensity during earthquakes (with intensity $\geq$ 3b) in the vicinity of Almaty which took place in 2006-2017. The increase of thermal neutrons flux of the lithospheric origin during of seismic processes activation was observed for $\sim$ 60% of events. However, before the earthquake the increase of thermal neutron flux is only observed for $\sim$ 25-30% of events. It is shown that the amplitude of the additional thermal neutron flux from the Earth's crust is equal to 5-7% of the background level. Sometimes it reaches values of 10-12%.