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# Neutrons produced by the Earth's crust due to Lunar and Solar tides

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The results presented in the report are based on the measurements of thermal neutrons flux produced by the Earth's surface during the experiment carried out in Pamir region at the altitude of 4200 m above sea level for the period from August 1 till August 14, 1994.
The neutrons in the Earth's atmosphere are produced mainly during the interactions between the primary cosmic rays nucleons and nuclei with energy over 1 GeV with the nuclei of the elements of the atmosphere at the fission of the atmosphere's elements nuclei. At this energy over 90% of the primary cosmic rays are protons. So we consider that the neutrons in the Earth's atmosphere are mainly produced during the interactions between the primary cosmic rays protons with energy over 1 GeV and the nuclei of the atmosphere's atoms. Consequently, neutrons intensity variations in the atmosphere can be associated with the variations of the protons flux. Geomagnetic cut-off rigidity for the experimental site (Moskvina meadow) is 9.2 GV, so energy threshold for the primary protons is 8.3 GeV.
The period from August 1 till August 14, 1994 was quiet in terms of heliophysical and geophysical conditions. No essential variations of cosmic rays in the interplanetary space and neutrons at the ground-based neutron monitors were observed, geomagnetic conditions was quiet, no chromospheric flares on the Sun were detected. During the period from August 1 till August 9 Kp-index did not exceed 2, on August 8 for a long time it was about 0. At the end of August 9 Kp-index began to increase and reached 4 at the evening of August 10. It left at this level till August 14 and then decreased. Under quiet geomagnetic conditions and absence of chromospheric flares the intensity of the secondary cosmic rays neutrons at the Moskvina meadow was expected to stay almost constant. Although spatial anisotropy of the cosmic rays intensity leads to cosmic rays daily variations due to the Earth's rotation, their value is small: for energy of several GeV daily variations are less than 1%. Nevertheless, according to the measurements during the period from August 1 till August 14, 1994 neutrons counting rate changed twofold and more throughout the day. Neutrons flux increased with approaching to the crossing of the local meridian by the Moon or the Sun, and then it decreased to the former level. The mentioned circumstances exclude the possibility for explanation of these variations by the known extraterrestrial factors.
In the present report the authors show that the observed increases of the neutron intensity are caused by lunar and solar tides.

## Collaboration

– not specified –

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