Long-term monitoring of neutron component of radiation background onboard International Space Station.

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The Board Telescope of Neutrons (BTN) is a neutron spectrometer which was installed outside of the Russian “Zvezda” module of the International Space Station (ISS) in November 2006. The main goals of this experiment include measurement of neutron flux in broad energy band from low epithermal neutrons (>0.4 eV) up to fast neutrons (<15 MeV); investigation of its spatial variations at low and high geomagnetic latitudes above the South Atlantic anomaly (SAA) and at different orbital altitudes; observations of GCR variations on different time scales from orbital fluctuations to variations affected by the 11-year solar cycle; estimation of the neutron component of radiation background outside ISS during various flight conditions in near-Earth orbit.

In this study we present measurements of neutron-flux spectral density in the vicinity of the International Space Station (ISS) based on BTN-Neutron space experimental data for the period 2007-2019. Neutron flux shows space and time variations. It varies by several orders of magnitude between equatorial latitudes and flybys across South Atlantic anomaly region. The time profile of neutron flux also demonstrates long-periodic variations produced by variations of GCRs and modulated by 11 year solar cycle. The observed amplitude of such variations is about two times. We have compared it with other space neutron monitors installed on Moon (NASA/LRO), Mars (NASA/Odyssey, ESA/ExoMars) and Mercury (ESA/BepiColombo) missions.

We also used neutron measurements to evaluate biological impact contributed by neutrons and expressed in neutron equivalent dose rate.