Opportunities to expand neutron monitors network in order to increase its sensitivity to low-energy cosmic rays

S. A. Siruk, A. G. Mayorov, R. F. Yulbarisov

National Research Nuclear University MEPhI, Moscow 115409, Russia

The worldwide neutron monitors (NMs) network is a useful instrument for studying cosmic ray (CR) fluxes in the vicinity of Earth. The minimal energy of CR that still give their contribution to NM's count rate is determined by the Earth's magnetosphere over most of the planet's surface. This geomagnetic cutoff is maximal near the equator and becomes marginal close to the magnetic poles, so in polar regions the particles' minimal energy is mainly defined by the depth of the atmosphere instead. This means that polar NMs are basically more sensitive to low-energy CR and therefore to variations of galactic CR flux and bursts of solar energetic particles (SEP events). Additionally, polar stations are essential to study CR anisotropy, with some of them having very narrow asymptotic cones of acceptance and some being able to detect particles coming from high asymptotic latitudes.

Most polar NMs are located at sea level; however, there are polar regions with mountains or ice sheets, where the atmospheric depth is significantly lower. If stations are located at those places, they are even more sensitive to solar modulation and SEPs, and recent installation of such a detector caused the introduction of a new type of events, called sub-GLE. This study is dedicated to the search for such places and calculation of conditions for CR observations made by potential NMs that might be installed there. We simulated detectors' response to several SEP events and found that some of new NMs located at those places would be even more sensitive to low-energy cosmic rays than currently operating high-altitude polar observatories SOPO/SOPB, DOMC/DOMB and SNAE/SANB. Having 32 locations reviewed in total, we can conclude that there are a lot of perspective variants, so new detectors located there would greatly complement the existing network.