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Neutron Monitor Yield Functions: Revisited approach

Mishev, Alexander[1,2], Usoskin, Ilya[1] and Kovaltsov, Gennady[3]
[1]University of Oulu, Finland
[2]Institute for Nuclear Research and Nuclear Energy, Bulgarian Academy of Sciences, Sofia, Bulgaria
[3]Ioffe Physical-Technical Institute, St. Petersburg, Russia

A neutron monitor provides a routine measure of cosmic ray variations in the vicinity of Earth. Here we present a new yield function of the standard sea-level 6NM64 neutron monitor for primary proton and alpha cosmic ray nuclei. The computations were made using Planetocosmics and CORSIKA Monte-Carlo tools for atmospheric cascade simulation. Fluxes of secondary neutron and protons were obtained using the standard electromagnetic model and QGSP_BIC_HP hadron interaction model. A realistic curved atmospheric model was applied. An updated information concerning NM registration efficiency for secondary neutrons and protons was used. The NM yield function is obtained by convolution of secondary particle flux and NM registration efficiency. In addition the effect of the geometrical correction of the neutron monitor effective area is considered. This correction enhances the relative impact of higher-energy cosmic rays, namely with energy above 5-10 GeV/nucleon in NM count rate. The newly calculated yield function, corrected for this geometrical factor is fully consistent with the experimental latitude surveys of neutron monitors performed during three consecutive solar minima in 1976-77, 1986-87 and 1996-97.