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Relation of muon flux local anisotropy with primary spectrum index

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URAGAN is a wide-aperture precision muon hodoscope located in Moscow, Russia, 55.7° N, 37.7° E, 173 m a.s.l. It allows to obtain the angular distribution of the muon flux. This distribution may be characterized by a vector of local anisotropy (the sum of the vectors of the particle arrival directions, normalized to the total number of muons). It was shown earlier that annual variations in the vertical projection of the anisotropy vector A_Z are observed, and they are not related with changes in atmospheric conditions. It was supposed that the annual variations are caused by changes in the shape of the energy spectrum of primary particles. The dependence of A_Z on the index of the primary particles spectrum γ was calculated for several zenith angle intervals with the help of simulation of generation and propagation of secondary cosmic ray particles through the atmosphere using the CORSIKA program package. Experimental temporal series of the vertical projection of the local anisotropy A_Z for several intervals of zenith angles were obtained for 2007-2015. For A_Z estimations, 1 h averaged muon matrices with corrections for barometric and temperature effects were used. According to obtained A_Z time series, the average annual daily changes of $\Delta\gamma$ were estimated. Annual and daily changes in the slope of the energy distribution of primary protons are observed. In the range of the mean energy of primary protons 70-110 GeV the annual changes of γ are 0.02-0.04, and the daily changes are 0.0025-0.004.

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