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Energy characteristics of multi-muon events in a wide range of zenith angles

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Study of the energy characteristics of EAS muon component with an increase the primary particle energy can be a key to solving the “muon puzzle” –the problem of muon excess in EAS observed in several experiments. Such investigations are currently being conducted in the NEVOD-DECOR experiment on detection of inclined muon bundles. Cherenkov water detector NEVOD measures the energy deposit of muons, which is almost linearly related to their energy. Coordinate-tracking detector DECOR measures the number of muons and their direction. The detection of muon bundles of various multiplicities in a wide range of zenith angles allows to explore the interval of primary particles energies from 10^{16} to 10^{18} eV.

In the present work, data of long series of measurements from May 2012 to March 2016 are analyzed. The experimental data are compared with the results of calculations based on simulations of the muon component of EAS by means of the CORSIKA code.

It has been found that the average specific energy deposit in the Cherenkov calorimeter appreciably increases with zenith angle, thus reflecting the increase of the mean muon energy in the bundles. It is in a reasonable agreement with CORSIKA-based simulations of the EAS muon component. A possible evidence for an increase of the energy deposit at primary energies above 10^{17} eV is observed.

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