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Impact of invisible energy on the energy reconstruction of cosmic ray shower at the Pierre Auger Observatory

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Ultra high-energy cosmic ray showers (UHERCs) are being detected at the Pierre Auger Observatory (PAO) in Argentina. Calorimetric energy measured by fluorescence detectors does not represent the total energy of a shower. The part of shower energy called missing energy is carried away undetected mainly by muons and neutrinos. Monte Carlo simulations of UHERCs in CONEX and Corsika programs with hadronic interaction models EPOS LHC and QGSJET-II-04 are used to estimate the shower missing energy and the results are compared. Possible missing energy estimation using signals from surface detectors at the PAO is also investigated.

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