Study of Broad Scale Anisotropy of Cosmic Ray Arrival Directions from $2 \times 10^{17} eV$ to $10^{20} eV$ from Fly's Eye Data

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Abstract

We report results on the broad scale anisotropy of cosmic ray arrival directions in the energy rage from $2 \times 10^{17} eV$ to $10^{20} eV$. The data was taken by the Fly's Eye detector in both monocular and stereo modes of operation. We look for dependence on galactic latitude or supergalactic latitude by fitting the data to a Wdowczyk and Wolfendale plane enhancement function and a N-S gradient functional form. We report a small but statistically significant galactic plane enhancement in the energy range between $2 \times 10^{17} eV$ and $3.2 \times 10^{18} eV$. The probability that this anisotropy is due to fluctuations of an isotropic distribution is less than 0.06%. The most significant galactic plane enhancement factor $f_E = 0.104 \pm 0.036$ is in the energy range $0.4 - 1.0 \times 10^{18} eV$. No statistically significant evidence for a N-S gradient is found. There is no sign of significant deviation from isotropic background when the data is analyzed in terms of supergalactic latitude distributions.