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Lorentz Invariance Violation and the Spectrum and Source Power of Ultrahigh Energy Cosmic Rays FLOYD STECKER, NASA/GSFC, SEAN SCULLY, James Madison University — Owing to their isotropy, it is generally believed that ultrahigh energy cosmic rays (UHECRs) are extragalactic in origin. It is then expected that interactions of these cosmic rays with photons of the cosmic background radiation (CBR) should produce a drastic reduction in their flux above and energy of about 5×10^{19} eV (50 EeV), the so-called "GZK effect." At present, the existence of this effect is uncertain owing to conflicting observational data and small number statistics. We show here that a small amount of Lorentz invariance violation (LIV), which could turn off photomeson interactions of UHECRs with the CBR, could explain the UHECR spectrum as measured by *AGASA* which shows an excess of UHECRs at energies above 100 EeV. If new results from the *Auger* array agree with the *AGASA* spectrum, this may be interpreted as evidence for a small amount of LIV. If, on the other hand, the new results are consistent with the *HiRes* results favoring a GZK effect, this would place severe constraints on LIV and, by implication, on some Planck scale quantum gravity models. We also discuss the power requirements needed to explain the UHECR spectrum for a range of assumptions, including source evolution and LIV and show that in all cases our results disfavor a γ-ray burst origin for the UHECRs.

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