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Update on the indication of a mass-dependent anisotropy above 1e18.7 eV in the hybrid data of the Pierre Auger Observatory

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We test for a large-scale anisotropy in the mass of arriving cosmic-ray primaries as a function of galactic latitude. The sensitivity to primary mass is obtained through the depth of shower maximum, $X_{\rm max}$, extracted from hybrid events measured over a 14-year period at the Pierre Auger Observatory. The sky is split into distinct on- and off-plane regions using the galactic latitude of each arriving cosmic ray to form two distributions of $X_{\rm max}$ which are compared using an Anderson-Darling 2-samples test. A scan over roughly half of the data is used to select a lower threshold energy of $10^{18.7}$ eV and a galactic latitude splitting at $|b| = 30^{\circ}$, which are set as a prescription for the remaining data. With these thresholds, the distribution of $X_{\rm max}$ from the on-plane region is found to have a $9.1 \pm 1.6^{+2.1}_{-2.2}$ g/cm^2 shallower mean and a $5.9 \pm 2.1^{+3.5}_{-2.5}$ g/cm^2 narrower width than that of the off-plane region and is observed in all telescope sites independently. These differences indicate that the mean mass of primary particles arriving from the on-plane region is greater than that of those from the off-plane region. Monte Carlo studies yield a 5.9×10^{-6} random chance probability for the result in the independent data, lowering to a 6.0×10^{-7} post-penalization random chance probability when the scanned data is included. Accounting for systematic uncertainties leads to an indication for anisotropy in mass composition above $10^{18.7}$ eV with a $3.3\,\sigma$ significance. Furthermore, the result has been newly tested using additional independent FD data recovered from the quality selection process. This test disfavors the null hypothesis of the on- and off-plane regions being uniform in composition at $2.2\,\sigma$ which is in good agreement with the expected sensitivity of the dataset used for this test. Possible interpretations, accompanying results and plans for further tests will be presented.

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