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Large-Angular-Scale Clustering as a Clue to the Source of UHECRs

Abstract content

We explore what can be learned about the sources of UHECRs from their large-angular-scale clustering (referred to as their “bias” by the cosmology community). Exploiting the clustering on large scales has the advantage over small-scale correlations of being insensitive to uncertainties in source direction from magnetic smearing or measurement error. In a Cold Dark Matter cosmology, the amplitude of large-scale clustering depends on the mass of the system, with more massive systems such as galaxy clusters clustering more strongly than less massive systems such as ordinary galaxies or AGN. Therefore, studying the large-scale clustering of UHECRs can help determine a mass scale for their sources, given the assumption that their redshift depth is as expected from the GZK cutoff. We investigate the constraining power of a given UHECR sample as a function of its cutoff energy and number of events. We show that current and future samples should be able to distinguish between the cases of their sources being galaxy clusters, ordinary galaxies, or sources that are uncorrelated with the large-scale structure of the universe.

If this papers is presented for a collaboration, please specify the collaboration

Summary

Reference

Proceedings of the 30th International Cosmic Ray Conference; Rogelio Caballero, Juan Carlos D’Olivo, Gustavo Medina-Tanco, Lukas Nellen, Federico A. Sánchez, José F. Valdés-Galicia (eds.); Universidad Nacional Autónoma de México, Mexico City, Mexico, 2008; Vol. 2 (OG part 1), pages 157-160

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