

Bayesian Source Fraction Analysis of Ultra-High-Energy Cosmic Rays and the Impact of the Galactic Magnetic Field

The sources of Ultra-High-Energy Cosmic Rays (UHECRs) have yet to be discovered due to the extensive number of parameters that influence the primary energy and direction. The Galactic Magnetic Field (GMF) strongly influences the deflections of said UHECRs and is a crucial factor in determining UHECR sources. In this work, we build upon the idea of the Bayesian source fraction analysis framework developed by Soiaporn et al. (arXiv:1206.4569) and further extended by Capel and Mortlock (arXiv:1811.06464). The previous analysis framework utilizes Bayesian analysis to associate extragalactic sources from known catalogs to the detected energies and directions of UHECRs measured from the Pierre Auger Observatory. We extend this by introducing the effect of the non-uniform deflections within the GMF using the CRPropa3 simulation code. We further investigate the impact of heavier composition on the inferred source associations. Using the public data from the Telescope Array experiment, we observe that more source-UHECR associations are present in the Northern Sky as compared to those in the Southern Sky.

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