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What number of cosmic ray events do we need to measure source catalogue correlations?

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Recent comparison studies of cosmic ray arrival directions and active galactic nuclei have resulted in evidence for correlation with weak significance against an isotropic source distribution. In this paper we address the question of what sample size is needed to measure a highly statistical significant correlation to a parent source catalog. We compare several scenarios for the directional scattering of ultra-high energy cosmic rays given our current knowledge of the galactic and intergalactic magnetic fields. We find significant correlations between an assumed source catalog if the cosmic rays are primarily composed of protons and there are greater than 1000 events, and that inclusion of galactic magnetic field scattering weakens that significance.

Collaboration

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Author: DOLCI, Marco (Politecnico di Torino)

Co-authors: ROMERO-WOLF, Andrew (Jet Propulsion Laboratory, California Institute of Techology); WISSEL, Stephanie (UCLA)

Presenters: ROMERO-WOLF, Andrew (Jet Propulsion Laboratory, California Institute of Techology); WISSEL, Stephanie (UCLA)

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