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Cosmographic model of the astroparticle skies

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Modeling the extragalactic astroparticle skies involves reconstructing the 3D distribution of the most extreme sources in the Universe. Full-sky tomographic surveys at near-infrared wavelengths have already enabled the astroparticle community to bind the density of sources of astrophysical neutrinos and ultra-high cosmic rays (UHECRs), constrain the distribution of binary black-hole mergers and identify some of the components of the extragalactic gamma-ray background. This contribution will present the efforts of cleaning and complementing the stellar mass catalogs developed by the gravitational-wave and near-infrared communities, in order to obtain a cosmographic view on stellar mass (M_*) and star formation rate (SFR). Unprecedented cosmography is offered by a sample of about 400,000 galaxies within 350 Mpc, with a 50-50 ratio of spectroscopic and photometric distances, M_*, SFR and corrections for incompleteness with increasing distance and decreasing Galactic latitude. The inferred 3D distribution of M_* and SFR is consistent with cosmic flows. The M_* and SFR densities converge towards values compatible with deep-field observations beyond 100 Mpc, suggesting a close-to-isotropic distribution of more distant sources. In addition to discussing relevant applications for the four astroparticle communities, this contribution will highlight the distribution of magnetic fields at Mpc scales deduced from the 3D distribution of matter, which is believed to be crucial in shaping the ultra-high-energy sky. These efforts provide a new basis for modeling UHECR anisotropies, which bodes well for the identification of their long-sought sources.

Keywords

galaxy masses; large-scale structure of the universe; particle astrophysics; scaling relations; sky surveys

Collaboration

other Collaboration

Subcategory

Theoretical Results

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