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Assessing the signatures imprinted by star-forming galaxies in the cosmic gamma-ray background

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In recent years, high-energy gamma-ray emission has been detected from star-forming galaxies in the local universe, including M82, NGC 253, Arp 220 and M33. The bulk of this emission is thought to be of hadronic origin, arising from the interactions of cosmic rays (CRs) with the interstellar medium of their host galaxy. More distant star-forming galaxies would also presumably be bright in gamma-rays, but these would not be resolved as point sources. Instead, they contribute gamma-rays as unresolved sources to the extra-galactic gamma-ray background (EGB). However, despite the wealth of high-quality all-sky EGB data from the Fermi-LAT gamma-ray space telescope collected over more than a decade of operation, the exact contribution of SFGs to the EGB and the signatures their emission would imprint on the gamma-ray sky remains unsettled. In this talk, I will discuss how this can be assessed by modelling the gamma-ray emission from SFG populations above 1 GeV. I will demonstrate that such emission can be characterised by just a small number of key physically-motivated parameters, and outline how source populations would leave anisotropic signatures in the EGB. I will consider model signatures that may be imprinted population classes and discuss how such imprints could yield information about the underlying properties and evolution of SFGs over cosmic time.

Keywords

cosmic rays, gamma-rays:diffuse background, gamma-rays:galaxies, galaxies:starburst, galaxies:star-formation, galaxies:ISM

Collaboration

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