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Giant Molecular Clouds: The Epicentre of gamma-rays and neutrino Emission in the Milky Way

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Abstract: Giant molecular clouds (GMCs) are massive, dense areas of gas (mostly hydrogen) and dust in the Interstellar Medium (ISM). They provide a thick target for the Cosmic Rays (CR) to interact and produce gamma-rays and neutrinos. As these particles are neutral they are unaffected by the galactic magnetic fields and can be used to probe the origins and nature of the CR particles. In our recent work, we have estimated the diffuse emission of gamma-ray and neutrino from the Galactic plane considering a large population of GMCs in the Milky Way (MW). We considered two cases of CR distribution in our calculation: (1) the locally observed CR flux interacts with all the GMCs and (2) a radially dependent CR flux. The calculated gamma-ray and neutrino fluxes of each GMC were also compared with the sensitivity of current and future-generation detectors to find some potential source candidates. The flux from all the GMCs then stacked together and compared with the flux observed with the Fermi-LAT and IceCube detector, yielding consistent results.

Primary author: ROY, Abhijit (ARIES, Nainital)

Presenter: ROY, Abhijit (ARIES, Nainital)

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