

A first comprehensive analysis of the distributions of the ISM, gamma-rays, and X-rays over the Large Magellanic Cloud

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Diffuse gamma-ray emission is thought to be primarily produced by interactions between cosmic-ray protons and interstellar protons via hadronic processes. Therefore, it provides a valuable opportunity to obtain a comprehensive understanding of cosmic-ray distribution and the interstellar gaseous medium. We present the first analysis of the spatial distributions of GeV and TeV gamma-rays, hard and soft X-rays, and interstellar molecular/atomic clouds over the whole Large Magellanic Cloud (LMC). We have found the global distribution of Fermi gamma-rays closely resembles that of interstellar molecular and atomic hydrogen gas, as revealed by the NANTEN CO and ATCA & Parkes HI. Locally, gamma-rays excesses are spatially coincident with the positions of X-ray bright supernova remnants observed with eROSITA. We also found that there are no X-ray and CO/HI counterparts for the gamma-ray excess inside LMC 4, suggesting that localized ionized gas may also act as a target for cosmic-ray protons. In addition, we will discuss the origin of diffuse soft X-rays in the LMC as produced by the supersonic gas collisions as driven by the tidal interaction between the LMC and the SMC. The present comparisons mark a first step toward a full understanding of the interplay between the high energy radiations and the cool ISM in a galaxy.

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