Contribution ID: **33** Type: **Contributed**

Study of the Cosmic Rays and Interstellar Medium in local HI Clouds using Fermi-LAT Gamma-Ray Observations

Tuesday, 13 April 2021 15:30 (15 minutes)

An accurate estimate of the interstellar gas density distribution is crucial to understanding the interstellar medium (ISM) and Galactic cosmic rays (CRs). However, a significant amount of gas not traced properly by standard radio line surveys ("dark gas") has been preventing accurate measurement of the total neutral gas column density and CR intensity. To overcome this difficulty, we performed a detailed study of the ISM and CRs in the mid-latitude region of the third quadrant. We used the Fermi-LAT data in the 0.1-25.6 GeV range and other interstellar gas tracers such as the HI4PI survey and the Planck dust model. Even though this region was analyzed in an early publication of the Fermi-LAT collaboration using six months of data, the analysis was significantly improved using eight years of Fermi-LAT data with the aid of newly available gas tracers and with the northern and southern regions treated separately. We used gamma-rays as a robust tracer of the ISM gas and obtained the integrated gamma-ray emissivities above 100 MeV as (1.58 +/- 0.04) * 10ˆ-26 photons sˆ-1 srˆ-1 H-atomˆ-1 and (1.59 +/- 0.02) * 10ˆ-26 photons sˆ-1 srˆ-1 H-atomˆ-1 in the northern and southern regions, respectively, supporting the existence of a uniform CR intensity in the vicinity of the solar system. Our emissivity agrees with the calculation using the model based on the directly measured CR proton spectrum. However, we caution that the uncertainty of the gamma-ray emissivity model is still at the 20% level. In this contribution, we will present the details of the data analysis, results, and implications of CRs and ISM in the local environment.

Primary author: MIZUNO, Tsunefumi (Hiroshima University)

Presenter: MIZUNO, Tsunefumi (Hiroshima University)

Session Classification: Diffuse Gamma Rays & Cosmic Rays

Track Classification: Diffuse