PROCEEDINGS OF SCIENCE

Study of the Interstellar Medium and Cosmic Rays in local H I Clouds

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Aims. We aim to study the interstellar medium (ISM) and cosmic-rays (CRs) in a mid-latitude region in the third Galactic quadrant (Galactic longitude l from 200° to 260° and latitude $|b|$ from 22° to 60°). The region is expected to be dominated by local H I clouds since it is located at high latitude and free of know large molecular clouds.

Methods. We evaluated the total gas column density $N(\mathrm{H_{tot}})$ by investigating the correlations among 21 cm survey data (HI4PI), *Planck* dust thermal emission models (optical depth at 353 GHz τ_{353} and radiance R), and *Fermi*-LAT γ-ray data in the region studied. In the South region, we first masked areas containing an intermediate velocity cloud or the Orion-Eridanus superbubble, and that with a ratio of the integrated H I 21-cm line intensity to dust emission significantly different from that seen in the rest of the region. We then fit the γ-ray data with a linear combination of gas template maps based on *Planck* dust models and other components to obtain the total gas column density $N(\mathrm{H_{tot,\gamma}})$.

Results & Prospects. We found that $N(\mathrm{H_{tot,\gamma}})/\tau_{353}$ and $N(\mathrm{H_{tot,\gamma}})/R$ depend on dust temperature T_d in the North region, indicating that that neither τ_{353} nor R were proportional to $N(\mathrm{H_{tot}})$. We also found that $N(\mathrm{H_{tot,\gamma}})$ is not proportional to τ_{353} but shows non-linear relation in the South region. We will examine the systematic uncertainties and discuss ISM and CR properties inferred from γ-ray data.

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