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# A 3D view of our Galaxy : gas and Cosmic rays

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## Abstract

The diffuse gamma-ray emission indirectly produced by the interaction of Galactic cosmic rays (CR) with interstellar gas depends on the gas and CR densities. We have studied the properties of gas, dust, and CR in the Galactic plan ( $|b| < 10^\circ$ ) using jointly the gamma-ray observations of the Fermi Large Area Telescope, the dust optical depth inferred from Planck and IRAS observations, and the HI and CO line emission surveys. Precise modelling of the diffuse gamma-ray emission of interstellar origin across the Galaxy requires to trace the total gas column density in three-dimension. So we have used the HI and CO emission lines to estimate the kinematic distance of the gas in the atomic and molecular phases. We also mapped the dark gas not seen, or poorly traced, by HI and CO emissions but revealed by both dust and gamma-ray emissions. We have combined the information provided by the different tracers to construct a 3D map of the total gas column density divided into Galactocentric rings. The measurement of the average gamma-ray emissivity per gas nucleon in each Galactocentric ring gives us an insight on large-scale CR properties variations across the Galaxy.

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