EGRET Observations of Diffuse Gamma-Ray Emission in Taurus and Perseus
S. W. Digel (USRA/NASA GSFC) & I. A. Grenier (Université Paris 7 and Service d’Astrophysique, CE Saclay)

Abstract

The interstellar emission observed by EGRET in the Taurus/Perseus region can be well modeled using the new composite CO survey of Dame, Hartmann, & Thaddeus (2001) for the gas useful for calibrating the emission. The emissivity above 100 MeV has a much more significant variation compared to the emission at GeV energies. This may be understood in terms of the cosmic-ray density and the molecular mass-calibrating ratio N(H2) (e.g., Dickman 1978). The ratio N(H2) is commonly used as a tracer for the column density of gas.

5. Analysis

The results of the search for point sources are shown in Table 1, and the gamma-ray intensity observed by EGRET with the maximum likelihood method (Mattox et al. 1996). The observed numbers of photons in the energy range 100–10,000 MeV are compared with the predictions of the model. The observed intensity decreases with increasing latitude, and the gradient term may partially compensate for the inverse dependence on latitude. In fact, the absence of a GeV excess in the Taurus/Perseus emissivity may be modified by the inverse Compton emission. The interstellar cloud complexes observed by EGRET at energies above 100 MeV, and the associated gamma-ray emission, are consistent with the values for other local clouds studied with EGRET (Dickman 1978).

6. Results

The exposure of EGRET for the representative energy range 100–10,000 MeV is shown in Figure 3. The exposure map is used for calibrating the emission. The emissivity of the gamma rays is derived from the number of photons observed in the energy range 100–10,000 MeV, and the maximum likelihood method (Mattox et al. 1996) is used to reduce statistical fluctuations. Positions of point sources in the gamma-ray maps are compared with the model used for the 3EG catalog and tabulated in Table 1. The results of the analysis are shown in Figure 4.

Appendix A

The gamma-ray map shows the distribution of high-energy cosmic rays within 1 kpc of the sun. The map is shown in Figure 5, and the associated gamma-ray intensity observed by EGRET is shown in Figure 6. The gamma-ray intensity decreases with increasing latitude, and the gradient term may partially compensate for the inverse dependence on latitude. In fact, the absence of a GeV excess in the Taurus/Perseus emissivity may be modified by the inverse Compton emission. The interstellar cloud complexes observed by EGRET at energies above 100 MeV, and the associated gamma-ray emission, are consistent with the values for other local clouds studied with EGRET (Dickman 1978).

References

This is a list of references that are used in the paper. The references are as follows:

7. IAU Symp. 157, 69 (1992)