A 3D TIME-DEPENDENT MODEL FOR GALACTIC COSMIC-RAYS AND GAMMA-RAYS

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The diffuse continuum gamma-ray emission from the Galaxy measured by EGRET and COMPTEL have been the subject of many studies relating to cosmic-ray origin and propagation. Normally it has been assumed that the source function can be assumed smooth and time-independent, an approximation justified by the long residence time ($> 10^7$ years) of cosmic-rays in the Galaxy. However, especially for electrons at high energies where energy losses are rapid, the effect of the stochastic nature of the sources becomes apparent and indeed has been invoked to explain the GeV excess in the diffuse emission observed by EGRET. In order to address this problem in detail a model with explicit time-dependence and a stochastic SNR population has been developed, which follows the propagation in three dimensions. The results indicate that the resulting inhomogeneities are important even at lower electron energies and for nuclei, where the energy losses are much smaller. Detailed comparisons of the predicted gamma-ray spectrum and angular distribution will be presented, and the consequences for the interpretation of diffuse continuum gamma-ray data discussed.