CONSTRAINTS ON COSMIC CHEMICAL EVOLUTION FROM THE GAMMA-RAY BACKGROUND

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The bulk of the observed isotropic Cosmic γ-ray Background (CGB) in the MeV region measured by COMPTEL (Kappadath et al. 1996) and SMM (Watanabe et al. 1997) is believed to be due to the emission from past supernovae (e.g., The et al. 1993). γ-ray line emission from the decay ^{56}Ni $\rightarrow$ ^{56}Co $\rightarrow$ ^{56}Fe in Type Ia supernovae dominates due to their large production of ^{56}Ni and a higher photon escape probability in comparison to Type II supernovae. We derive the theoretical background spectrum using realistic supernova γ-ray transport models, and by integrating over the cosmic star formation history (SFH), which has recently been determined by several groups. The observed CGB places a significant constraint on the SFH. A factor three enhancement of the SFH relative to that derived from galaxy surveys would be inconsistent with the observed CGB, unless supernovae produce much lower γ-ray luminosities than current models suggest.

References

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