

DIFFUSE GAMMA-RAY EMISSION FROM LOCAL GROUP GALAXIES

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We systematically estimate the expected diffuse γ -ray flux from Local Group galaxies, and determine their detectability by new generation γ -ray observatories such as GLAST. For each galaxy, the expected γ -ray flux depends only on its total gas content and its cosmic ray flux. We present a method for calculating cosmic ray flux in these galaxies in terms of the observed rate of supernova explosions, where cosmic ray acceleration is believed to take place. We estimate the γ -ray flux for Local Group galaxies and find that our predictions are consistent with the observations for the LMC and with the observational upper limits for the Small Magellanic Cloud and M31. Both the Andromeda galaxy, with a flux of $\sim 1.0 \times 10^{-8}$ photons $\text{sec}^{-1} \text{cm}^{-2}$ above 100 MeV, and the SMC, with a flux of $\sim 1.7 \times 10^{-8}$ photons $\text{sec}^{-1} \text{cm}^{-2}$ above 100 MeV, are expected to be observable by GLAST. M33 is at the limit of detectability with a flux of $\sim 0.11 \times 10^{-8} \text{sec}^{-1} \text{cm}^{-2}$. Other Local Group galaxies are at least two orders of magnitude below GLAST sensitivity.