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Mapping the blazar γ-ray luminosity function into neutrino emission

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A remarkable detection was recently made when a high-energy neutrino event detected by IceCube was linked to the *Fermi*-LAT detected blazar TXS 0506+056. However, our knowledge of observable neutrino-emitting blazars is limited, hindering future investigations. To address this issue, we combine a physically motivated model with three key free parameters capable of producing both electromagnetic and neutrino emissions, along with a classification system based on observational trends, with a recent description of the cosmic blazar distribution through a luminosity function (LF). The LF and model are combined by mapping the dependence of LF parameters, i.e., a source's γ-ray luminosity (L_γ) and γ-ray photon index (Γ), to the model parameters, i.e., magnetization (σ) and bulk Lorentz factor (Γ_j). We then produce a γ-ray LF that is parameterized in terms of a radiation model capable of reproducing the spectral features and luminosities of different blazar subclasses. Using the parameterized LF, we compute the contribution of blazar subclasses to the diffuse neutrino flux and identify the most likely multi-messenger candidates.

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