

Multi-messengers from quasar outflows

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We show that the quasar outflows can naturally account for the missing component of the extragalactic gamma-ray background (EGB) below ~ 1 GeV through neutral pion production in interactions between protons accelerated by the forward outflow shock and interstellar protons. We adopt outflow parameters that best fit the most recent Fermi-LAT data on the EGB and derive a cumulative neutrino background of $\sim 10^{-7}$ GeV/cm²/s/sr at neutrino energies above 10 TeV, which naturally explains the most recent IceCube data without tuning any free parameters. Additionally, we show that the same quasar outflows are capable of accelerating protons to energies up to 10^{20} eV. The spectral shape and amplitude is consistent with recent observations for outflow parameters constrained to fit secondary gamma-rays and neutrinos without any additional parameter tuning. This indicates that quasar outflows simultaneously account for all three messengers at their observed levels.

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