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Unresolved blazars as sources of the diffuse astrophysical neutrino flux

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The origin of the astrophysical neutrinos detected by IceCube, whose energies extend up to a few PeV, is still unknown.
In this work we investigate blazars (a class of relativistic jets from the core of active galaxies) as sources of the diffuse astrophysical neutrino flux.
For a blazar of a given luminosity, we calculate the emitted neutrino spectrum using a recently developed numeric radiation model that simulates photo-hadronic interactions of cosmic rays in the jet.
We then consider an entire population of sources, taking into account the different evolution of BL Lacs and flat-spectrum radio quasars (FSRQs), two blazar sub-classes.
While the cumulative neutrino flux from resolved (catalogued) blazars has already been constrained through stacking analyses, we show that a population of low-luminosity, unresolved blazars (mostly BL Lacs) can dominate the diffuse neutrino flux at sub-PeV energies. On the other hand, in order not to violate the stacking limit, the contribution of resolved blazars (mostly bright FSRQs) must be suppressed, which allows us to place constraints on the baryonic loading of those sources. Our conclusions highlight the importance of future instruments like CTA, which will enable the observation of potential neutrino sources that are too dim or far away for current sensitivities.

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