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Neutrino Production Associated with Late Bumps in Gamma-Ray Bursts and Potential Contribution to Diffuse Flux at IceCube

IceCube has detected many TeV-PeV neutrinos, but their astrophysical origins remain largely unknown. Motivated by the observed late-time X-ray/optical bumps in some gamma-ray bursts (GRBs), we examine the correlation between IceCube neutrinos and GRBs allowing delayed neutrinos about 1 day after the prompt gamma rays. Although we have not found any definitive correlation, up to 10% of the events observed so far at IceCube may have been neutrinos produced by the late-time GRB activities at about 1 day. Assuming a connection between some IceCube events and the late GRB bumps, we show in a model-independent way that GRB sites capable of producing late PeV scale neutrinos should be nonrelativistic or mildly relativistic. We estimate the diffuse neutrino flux from such sources and find that they can possibly account for a few IceCube events. Future observations of high-energy neutrinos and late-time GRB afterglows can further test the above proposed connection.

Related session

Searching for neutrinos

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