

# IceCube search for neutrinos from precursors and afterglows of gamma ray bursts

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The sources and accelerating mechanisms of cosmic rays, with energies as high as  $10^{20}$  eV, are not completely understood. Gamma ray bursts (GRBs) have long been considered as promising source candidates, yet so far don't show evidence for a correlated neutrino signal to prove this hypothesis. Previous analyses by IceCube have searched for neutrino in coincidence with the prompt phase of the GRBs, typically lasting for 100s or less. Here I will describe a search for neutrino correlations before and after this prompt phase using an extended time window. Presently I am calculating the spatial and temporal coincidence of a list of GRBs with the neutrino detections made by IceCube and comparing the results for different precursor and afterglow models hypothesised for short and long duration GRBs. These searches build on a similar methodology as was used for the detection of longer time-scale transients such as blazar flares, applying it for the first time to short transients like GRBs.

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