Space Science Seminar
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Multi-Messenger Light Curves from Gamma-Ray Bursts

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As Gamma-ray bursts (GRBs) have long been considered as potential sources of high-energy (> 100 TeV) neutrinos and ultra-high-energy (> 10^9 GeV) cosmic rays (UHECRs). They remain promising point-source targets to look for correlated high-energy electromagnetic and neutrino emission, and may be the sources of UHECRs. The lack of correlation between neutrino arrival directions and the positions and times of known GRBs has motivated revisions of the joint multi-messenger emission mechanism in GRBs --- gamma rays, UHECRs, and neutrinos. By embedding said mechanism in a simulation of multiple internal collisions within a GRB jet, we obtain a robust prediction of a minimal diffuse GRB neutrino flux, likely within reach of the planned detectors. Our simulations generate realistic, synthetic gamma-ray light curves, with features that reflect the behavior of the central engine. By looking for specific features in the light curve --- broad time-pulses and time delays between energy bands --- one can assess whether a particular GRB is likely to be an intense neutrino emitter. Our results could be exploited in targeted GRB neutrino searches to cull a catalog of GRBs that are likely to be strong neutrino sources.

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