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X-ray Flares of GRBs in High-Energy Gamma Rays.

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X-ray flares are characterized by a sudden rebrightening of X-ray radiation during the afterglow phase of gamma-ray bursts (GRBs). While the majority of GRBs exhibit a flux temporal decay consistent with the standard afterglow model, approximately one-third of GRBs observed by the Swift X-ray Telescope (XRT) display these flares. These flares, which occur primarily within a thousand seconds after the initial burst (prompt emission), are thought to arise from processes related to the burst's central engine but their origin is still unknown. Proposed mechanisms include reverse shocks from interactions with surrounding material, late-time activity of the central engine, internal shocks within the jet at sub-relativistic velocities, magnetar activity in the central engine, and interactions with a clumpy surrounding medium.
In this talk, I will present a systematic study of X-ray flares using available multiwavelength data, looking at the possible emergence of high-energy (GeV) radiation detected by the Large Area Telescope (LAT) on the Fermi Satellite. This study examines flares' temporal and spectral evolution across keV to GeV energy ranges. Among 351 GRBs with flares detected by Swift-XRT over a 15-year of Fermi observations, 126 GRBs have simultaneous observations of flares from both telescopes. The talk will present the combined X-ray (keV) and gamma-ray (GeV) spectral properties of these flares and their theoretical implications.

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