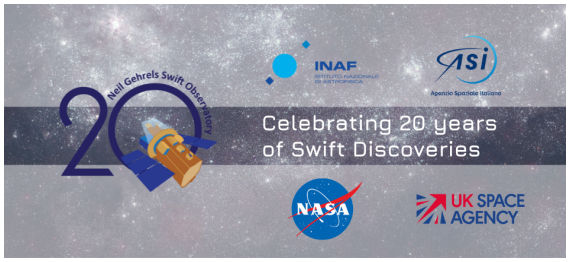

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Flares, energy injection, and decoding broadband GRB afterglows via XRT observations

Tuesday 25 March 2025 15:00 (15 minutes)

For the analysis of broadband radio-through-x-ray GRB afterglows, the x-ray observations made via the Niel Gehrels Swift X-ray Telescope (XRT) are a crucial tool. As the x-ray afterglow emission is not typically contaminated by any thermal counterpart (optical and infrared), nor affected by scintillation or self-absorption that can complicate the picture at radio, the post-burst x-ray emission can generally be assumed to purely trace the afterglow. For the short GRB 160821B, a detailed look at the XRT data revealed an episode of energy injection, which in turn allowed the subtraction of the optical afterglow model from the data, revealing the best sampled kilonova observed within the afterglow of a regular short-hard GRB. More recently, the XRT observations of GRB 231117A reveal a flare at ~2 hours post burst –the afterglow to this GRB again requires energy injection, however, unlike GRB 160821B, the required energy results in a violent shock system. Here I will describe how such a violent shock from energy injection can result in the observed x-ray flare and longer wavelength emission consistent with the broadband afterglow. The presence of significant energy injection in short GRBs supports the existence of longer-lived engines or outflow stratification, may hold clues to jet launching and baryon loading processes, and may help in understanding the NS-merger origin for the recent long-engine-duration merger-GRBs 211211A, and 230307A.

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