Swift Observation of GRB 131018A

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1   Introduction

At 12:47:48 UT, the *Swift* Burst Alert Telescope (BAT) triggered and located GRB 131018A (trigger=574935). *Swift* slewed immediately to the burst. The best *Swift* position is the enhanced X-ray position reported in Goad *et al.*, *GCN Circ.* 15352.

2   BAT Observation and Analysis

Using the data set from $T-239$ to $T+963$ s from the telemetry downlink, further analysis of BAT GRB 131018A (Melandri *et al.*, *GCN Circ.* 15349) has been performed by the *Swift* team (Ukwatta *et al.*, *GCN Circ.* 15354). The BAT ground-calculated position is RA(J2000) = 98.473 deg ($06^h\ 33^m\ 53.4^s$), Dec(J2000) = -19.897 deg ($-19°\ 53'\ 48.5''$) $\pm$ 1.3 arcmin (radius, sys+stat, 90% containment). The partial coding was 100%.

The mask-weighted light curve (Fig. 1) shows a single long peak starts at $\sim T+21$ s and ends at $\sim T+118$ s. T_{90} (15-350 keV) is 73.2 ± 18.9 s (estimated error including systematics).

The time-averaged spectrum from $T-21.1$ to $T+117.7$ s is best fit by a simple power-law model. The power law index of the time-averaged spectrum is 2.24 ± 0.14. The fluence in the 15-150 keV band is $(1.1 \pm 0.1) \times 10^{-6}\ ergs/cm^2$. The 1-sec peak photon flux measured from $T+59.41$ s in the 15-150 keV band is $0.5 \pm 0.1\ ph/cm^2/sec$. All the quoted errors are at the 90% confidencelevel.

3   XRT Observation and Analysis

We have analysed the XRT data for GRB 131018A (Melandri *et al.*, *GCN Circ.* 15349; D'Elia *et al.*, *GCN Circ.* 15356), from 119 s to ~ 36 ks after the BAT trigger. The enhanced XRT position for this burst is RA(J2000) = 98.471 deg ($06^h\ 33^m\ 53.12^s$), Dec(J2000) = -19.896 deg ($-19°\ 53'\ 46.3''$) $\pm$ 1.9 arcsec (radius, 90% confidence).

The light curve (Fig. 2) can be modelled with an initial power-law decay with $\alpha = 1.3^{+0.9}_{-0.8}$, followed by a steepening at $\sim T+130$ s to an alpha of $4.35^{+0.20}_{-0.18}$. At $\sim T+540$ s the light curve enters the plateau phase, maintaining a decay $\alpha = 0.29^{+0.05}_{-0.06}$ until $\sim T+30$ ks. After that time the decay index is $\alpha = 1.00^{+0.58}_{-0.23}$.

A spectrum formed from the WT mode data can be fitted with an absorbed power-law with a photon spectral index of $3.05^{+0.13}_{-0.12}$. The best-fitting absorption column is $(2.3 \pm 0.3) \times 10^{21}\ cm^{-2}$, consistent with the Galactic value of $2.0 \times 10^{21}\ cm^{-2}$ (Kalberla et al. 2005). The PC mode late time spectrum has a photon index of $2.25^{+0.19}_{-0.18}$ and a best-fitting absorption column of $(1.7 \pm 0.7) \times 10^{21}\ cm^{-2}$. The counts to observed (unabsorbed) 0.3-10 keV flux conversion factor deduced from this spectrum is $4.0 \times 10^{-11}\ (7.0 \times 10^{-11})\ erg\ cm^{-2}\ count^{-1}$.

4   UVOT Observation and Analysis

The UVOT began settled observations of the field of GRB 131018A $\sim$ 100 s after the BAT trigger (Melandri, *et al.*, *GCN Circ.* 15349). No optical afterglow consistent with the enhanced XRT position (Goad *et al.*, *GCN Circ.* 15352) is detected in the UVOT exposures.

The 3-σ upper limits using the UVOT photometric system (Breeveld et al. 2011, AIP Conf. Proc. 1358, 373) for the first finding chart (FC) exposure and subsequent summed exposures are:

Filter	T_{start} (s)	T_{stop} (s)	Exp (s)	Mag
white$_{FC}$	120	270	147	>21.3
u$_{FC}$	279	528	246	>20.5
white	120	13702	1588	>22.4
v	99	7600	581	>20.3
b	534	19468	2174	>22.0
u	279	18703	2368	>21.9
w1	657	17790	1382	>21.3
m2	632	7805	568	>20.5
w2	584	7395	568	>20.8

Table 1: 3σ upper limits from UVOT observations (De Pasquale & Melandri, *GCN Circ.* 15358). The values quoted above are not corrected for the Galactic extinction due to the reddening of $E_{(B-V)} = 0.26$ in the direction of the burst (Schlegel et al. 1998).
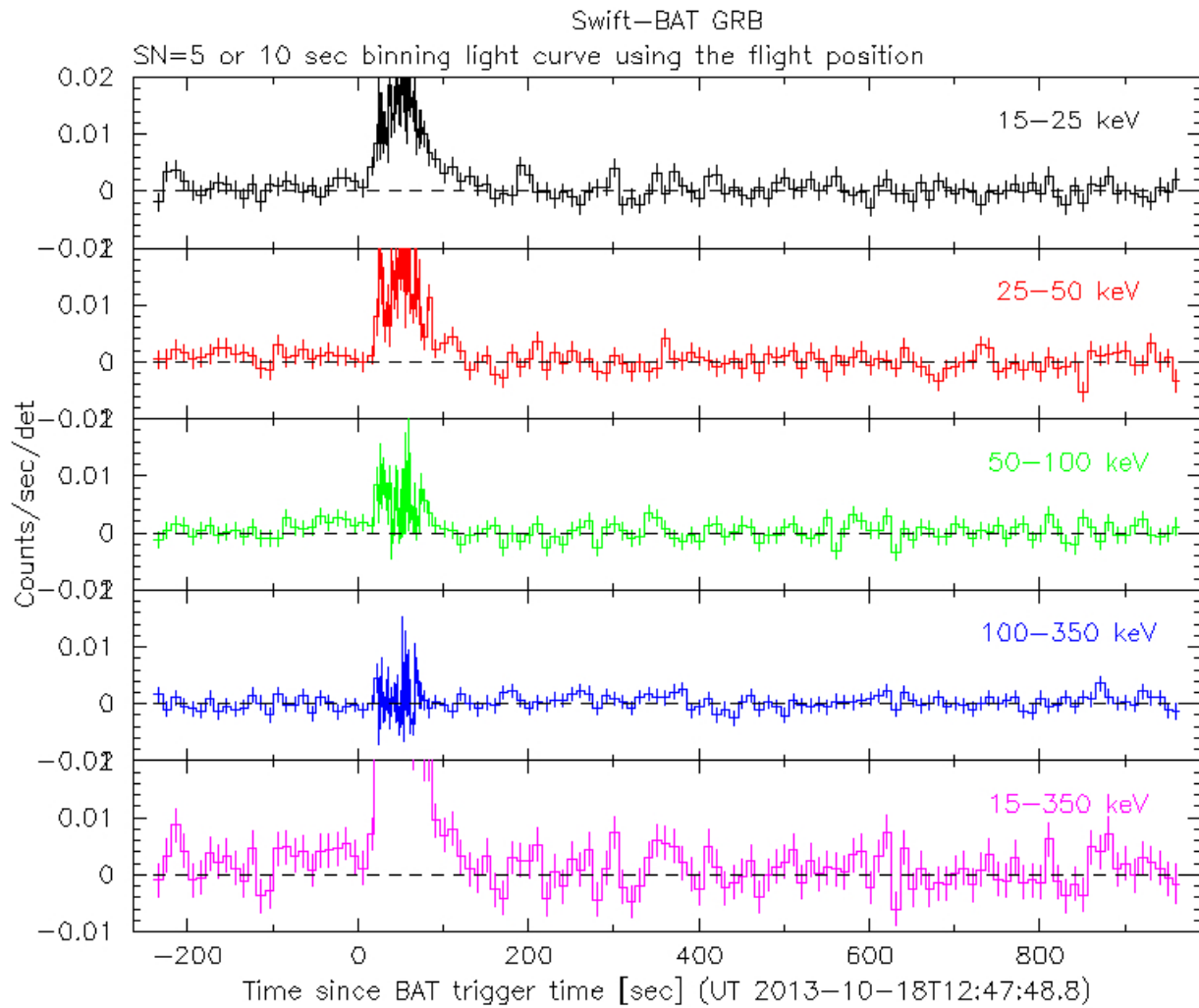
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Figure 1: BAT Light curve. The mask-weighted light curve in the 4 individual plus total energy bands (15 - 25, 25 - 50, 50 - 100, 100 - 350 and 15 - 350 keV).

Figure 2: XRT data of GRB 131018A from the *Swift*-XRT light curve repository (Evans et al., 2009, MNRAS, 397, 1177). WT settling mode (cyan), WT mode (blue) and PC mode (red) data are shown. Green lines mark the light curve break times, while the magenta band represents data that have been excluded from the light curve fit.