Gamma-ray Bursts: 15 Years of GRB Afterglows
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PHOTOMETRIC OBSERVATIONS OF GRB 080605 BY BOOTES-1B AND BOOTES-2

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Abstract. BOOTES-1B and BOOTES-2 were first to follow-up the *Swift* GRB 080605. Observations started 44 s after the GRB trigger, discovering the optical afterglow with the brightness of $R = 14.7$. A power-law decay with an $\alpha = 1.27 \pm 0.04$ was observed during the first ∼600 s after the trigger.

1 Introduction

The GRB in question was a long burst detected by Swift on June 5, 2008 at 23:43:57 UT Sbarufatti *et al.* (2008). The best known position is α (J2000) = 17:28:30.05, $\delta = +04$:00:56.2 from *HST* imaging. The host was found to be a metal enriched star forming galaxy at redshift 1.64 (Krühler *et al.* 2012). Zafar *et al.* (2012) analyzed the SED of GRB 080605 to show that its host galaxy exhibits the 2175 Å extinction feature.

In the vicinity of the afterglow location, there are several stars complicating the photometry with small and medium size telescopes Kann *et al.* (2008). From photometric points from *GROND* (Zafar *et al.* 2012), a power-law decay index of $\alpha_{\rm late} = 0.72$ can be derived.

2 Observation by BOOTES

BOOTES-1B reacted to the burst trigger and started to take images 44 s after the GRB. A series of 2 s unfiltered exposures were acquired. The pixel scale

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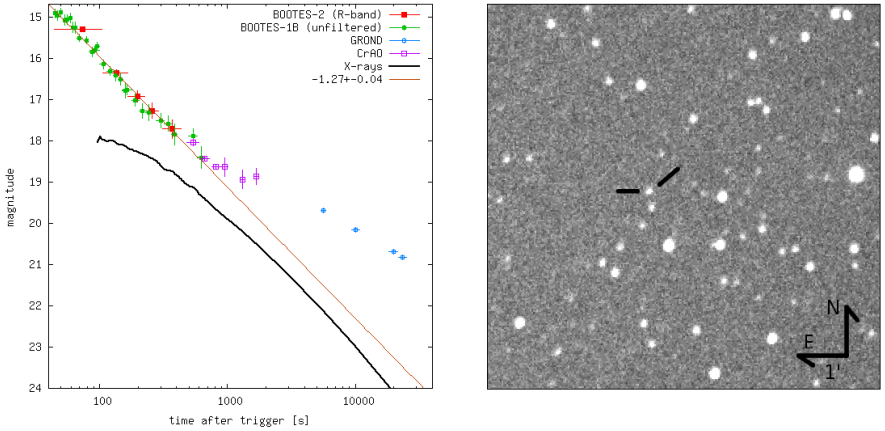

Fig. 1. *Left*: the optical and XRT lightcurve lightcurve of the GRB 080605, X-rays (Sbarufatti *et al.* 2008) have been scaled up by an arbitrary constant. *Right*: details of the surroundings of the optical afterglow of GRB 080605 as observed by BOOTES-1B. Image taken 45 s after the trigger.

of 2″/pixel does not permit us to spatially separate the optical transient from the nearby, 17. 8 m star. About 10 minutes after the trigger, the OT+star flux is dominated by the star and getting the OT brightness from then on becomes impossible. To obtain photometry, images were combined, resulting in longer exposure times. Eventually, 28 photometric points were obtained between 45 and 630 s after the GRB trigger. By a simultaneous fit of the decay rate α and the nearby star brightness $m_{\rm measured} = -2.5\,log_{10}(10^{-0.4m_\star} + 10^{-0.4m_{\rm OT,t_0}+2.5\alpha log_{10}t/t_0})$ we obtained $\alpha = 1.27 \pm 0.04$ and the brightness $m_\star = 17.81 \pm 0.03$. The photometric points obtained are in the Table 1 with the nearby star flux subtracted.

BOOTES-2/TELMA reacted in 44 s and obtained a series of 60 s R-band exposures. The images have the same problem as those from BOOTES-1B: it is impossible to distinguish the star and the OT. Five photometric points were obtained by flux subtraction of the star with $m_{\rm R} = 17.42 \pm 0.07$.

3 Discussion

BOOTES-1B and BOOTES-2 data were independently fitted and both provided the same decay index $\alpha = 1.27$ during the first 10 minutes after the trigger. A nearby star prevented prolonged follow-up with the coarse spatial sampling provided by BOOTES. X-ray lightcurve (Sbarufatti *et al.* 2008), seems to undergo a transition from a plateau into a power-law decay with $\alpha_{\rm X} = 1.47$. The optical lightcurve decay as seen by Zafar *et al.* (2012) between 1.5 and 6.5 h after the trigger is $\alpha_{\rm late} = 0.72$. There might be some trace of a transition between the two

Table 1. Photometric observations of the GRB 080605 optical afterglow, as obtained by BOOTES-1B and BOOTES-2. The brightness shown is after subtracting the flux of the nearby star. The first column shows the time in seconds since the burst trigger.

T [s]	exp	mag	dmag	tel	T [s]	exp	mag	dmag	tel
44.7	2.0	14.68	0.11	B-1B	158.5	15.0	16.55	0.18	B-1B
47.3	2.0	14.73	0.11	B-1B	164.7	27.0	16.53	0.13	B-1B
49.6	2.0	14.65	0.10	B-1B	190.7	24.0	16.79	0.15	B-1B
53.3	2.0	14.84	0.13	B-1B	215.7	25.0	17.05	0.18	B-1B
55.9	2.0	14.83	0.12	B-1B	241.9	26.0	17.08	0.20	B-1B
59.3	2.0	14.79	0.12	B-1B	300.1	43.0	17.28	0.18	B-1B
61.9	2.0	15.02	0.13	B-1B	343.3	43.0	17.35	0.19	B-1B
64.5	2.0	15.02	0.14	B-1B	386.1	39.0	17.62	0.26	B-1B
69.8	7.0	15.27	0.08	B-1B	428.9	42.0	17.80	0.28	B-1B
78.9	6.0	15.34	0.09	B-1B	537.0	84.0	17.66	0.17	B-1B
87.4	8.0	15.61	0.12	B-1B	627.3	94.0	18.18	0.27	B-1B
91.8	16.0	15.57	0.08	B-1B					
95.8	8.0	15.47	0.10	B-1B	74.1	60.0	15.28	0.03	B-2
107.2	14.0	15.91	0.11	B-1B	135.5	60.0	16.35	0.08	B-2
121.1	13.0	16.08	0.12	B-1B	196.7	60.0	16.91	0.14	B-2
133.7	13.0	16.19	0.13	B-1B	258.0	60.0	17.27	0.19	B-2
146.2	11.0	16.28	0.15	B-1B	371.4	121.0	17.70	0.23	B-2

optical decay rates detected by Rumyantsev and Pozanenko (2008) at about 700 s after the trigger.

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