ESO observing programme (XS-GRB)

Abstract

This release is the XS-GRB sample of Gamma-Ray Burst (GRB) afterglows. It consists of spectra of 103 individual afterglows observed within 48 hours of the GRB trigger and a few late-time host observations, included for completeness. Redshifts have been measured for 97 per cent of these, covering a redshift range from 0.059 to 7.84. These X-shooter spectra have been taken during a period of eight years corresponding to the ESO observing periods P84 through P98 under the following programme IDs: 084.A-0260, 085.A-0009, 086.A-0073, 087.A-0055, 088.A-0051, 089.A-0067, 090.A-0088, 092.A-0124, 093.A-0069, 094.A-0134, 095.A-0045, 096.A-0079, 097.A-0036, and 098.A-0055 (PI: Fynbo) and 0091.C-0934 (PI: Kaper). These proposals were initiated on Guaranteed Time. We have included a few additional bursts, from the programmes 084.D-0265 (PI: Benetti), 091.A-0877 (PI: Schady), 092.D-0056 (PI: Rau), 092.D-0633, 098.A-0136 (PI: Greiner), and 095.B-0811 (PI: Levan). The total collection of spectra represents *all* GRB afterglows that have been followed up by X-shooter up to 31-03-2017, which marks the end of the XS-GRB legacy follow-up program. Due to the transient nature of the targets followed up, the observing conditions vary significantly. This dataset provides a unique resource to study the ISM across cosmic time, from the local progenitor surroundings to the intervening universe. The data and scope are described in Selsing et al., arXiv: 1802.07727

Acknowledging these data products

Any publications using these data products must include a reference to to Selsing et al., arXiv:1802.07727

Overview of Observations

In order to secure a statistically homogenous sample that is complete in terms of the underlying distribution of the GRBs, we can used the following selection criteria to guide the observational follow-up:

- GRB trigger by BAT onboard the Swift~satellite
- XRT started observing within 10 minutes after the GRB; an XRT position must be distributed within 12 hr.
- The target must be visible from Cerro Paranal for at least 60 minutes, 30 degrees above the horizon, with the Sun below -12 degrees.
- Galactic A_V < 0.5 mag according to the maps of Schlegel et al. (1998).
- No bright, nearby stars.

In cases where the GRB exhibits unusual characteristics, we have also followed them out, even though they fall outside the selection criteria above.

We have not put any constraints on the observing conditions, since in the majority of cases, it is a priority to observe the rapidly faded afterglows before it becomes too faint for spectroscopic follow-up. For the majority of the bursts, we have observed with a slit width of 1”.0, 0”.9, and 0”.9 for the UVB, VIS, and NIR-arm respectively. This sets a lower limit on the delivered resolving power of the spectra based on the tabulated values of the delivered resolutions, which is 4350, 7450, and 5300 for the UVB, VIS and NIR-arm respectively. We provide an overview of all the observations in Table 1. Due to a mechanical failure, the atmospheric dispersion corrector (ADC) was disabled from 1st of August 2012 until the end of this program. Only GRB~100728B was affected by the failing ADC prior to disablement, resulting in a lower-than-nominal throughput. To avoid chromatic slit losses due to atmospheric dispersion, nearly all subsequent observations have been carried out at parallactic angle.

Release Content

We provide an overview on all the individual bursts in Table 1, which is reproduced from Selsing et al., arXiv:1802.07727. We here provide some distributions that characterise the sample presented here.

Fig 1. Afterglow magnitude at the start of observation and redshift completeness as a function of follow-up delay for all the afterglows that have been followed up. The points have been coloured based on the redshift of the corresponding burst. Red symbols indicate GRBs without a measured redshift and arrows indicate bursts for which the afterglow was not detected in the acquisition image. In red is shown the redshift completeness as a function of follow-up delay.

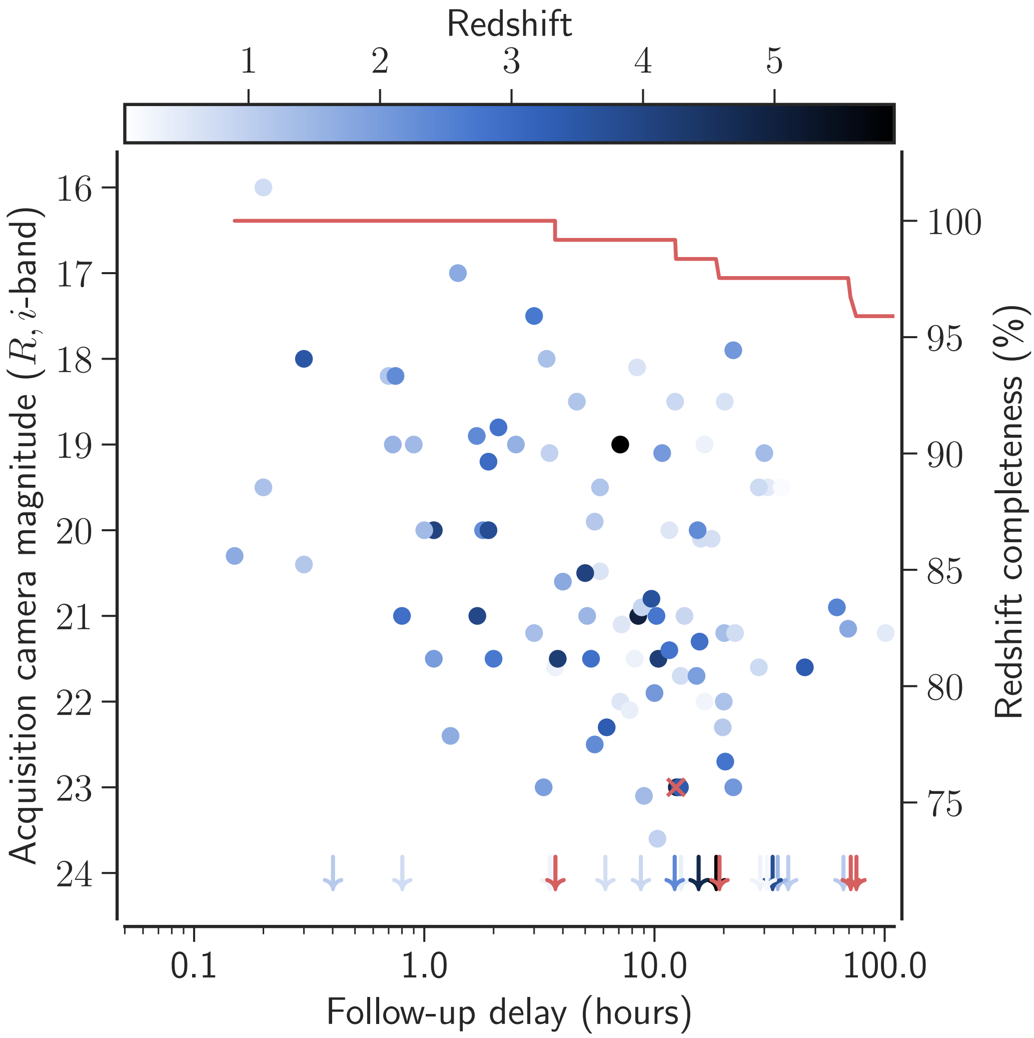


Table 1. The full sample of afterglows and hosts observed in the program. We here list the burst names and details of the spectroscopic observations. The exposure times and slit widths are given in the order UVB/VIS/NIR. The column Δt shows the time after trigger when the spectroscopic observation was started. $\mathrm{Mag}_{\mathrm{acq}}$ gives the approximate magnitude (typically in the R-band) of the afterglow or the host in the acquisition image.

GRB	Obs Date	Exptime (ks)	Slit width (arcsec)	Airmass	Seeing (arcsec)	Δt (hr)	$\mathrm{Mag}_{\mathrm{acq}}$	Redshift
GRB090313[a]	2009-03-15	6.9/6.9/6.9	1.0/0.9/0.9	1.2–1.4	1.5	45	21.6	3.374
GRB090530[a]	2009-05-30	4.8/4.8/4.8	1.0/1.2/1.2	1.6–2.2	1.7	20.6	22	1.266
GRB090809[a]	2009-08-10	7.2/7.2/7.2	1.0/0.9/0.9	1.2–1.1	1.1	10.2	21	2.737
GRB090926A[a]	2009-09-27	7.2/7.2/7.2	1.0/0.9/0.9	1.4–1.5	0.7	22	17.9	2.106
GRB091018	2009-10-18	2.4/2.4/2.4	1.0/0.9/0.9	2.1–1.8	1.0	3.5	19.1	0.971
GRB091127	2009-12-02	6.0/6.0/6.0	1.0/0.9/0.9	1.1–1.2	1.0	101	21.2	0.490
GRB100205A	2010-02-08	10.8/10.8/10.8	1.0/0.9/0.9	1.9–1.8	0.9	71	>24	–
GRB100219A	2010-02-20	4.8/4.8/4.8	1.0/0.9/0.9	1.3–1.1	0.8	12.5	23	4.667
GRB100316B	2010-03-16	2.4/2.4/2.4	1.0/0.9/0.9	2.0–2.4	0.6	0.7	18.2	1.180
GRB100316D-1[b]	2010-03-17	3.6/3.6/3.6	1.0/0.9/0.9	1.2–1.3	0.8	10	21.5	0.059
GRB100316D-2	2010-03-19	2.4/2.4/2.4	1.0/0.9/0.9	1.1–1.2	0.9	58	20.2	0.059
GRB100316D-3	2010-03-20	2.6/2.6/3.2	1.0/0.9/0.9	1.1–1.2	1.1	79	19.9	0.059
GRB100316D-4	2010-03-21	2.6/2.6/3.2	1.0/0.9/0.9	1.1–1.2	1.5	101	19.9	0.059
GRB100418A-1	2010-04-19	4.8/4.8/4.8	1.0/0.9/0.9	1.6–1.3	0.7	8.4	18.1	0.624
GRB100418A-2	2010-04-20	4.8/4.8/4.8	1.0/0.9/0.9	1.2–1.3	0.6	34	19.2	0.624
GRB100418A-3	2010-04-21	4.8/4.8/4.8	1.0/0.9/0.9	1.2–1.4	0.7	58	>24	0.624
GRB100424A[c]	2013-03-11	4.8/4.8/4.8	1.0/0.9/0.9	1.1–1.2	0.9	25239	>24	2.465
GRB100425A	2010-04-25	2.4/2.4/2.4	1.0/0.9/0.9	1.5–1.3	0.7	4	20.6	1.755
GRB100615A[c]	2013-03-05	4.8/4.8/4.8	1.0/0.9/0.9	1.0–1.1	0.9	23859	>24	1.398
GRB100621A	2010-06-21	2.4/2.4/2.4	1.0/0.9/0.9	1.3–1.4	1.0	7.1	22	0.542
GRB100625A[c f]	2010-07-07	4.8/4.8/4.8	1.0/0.9/0.9	1.1–1.0	0.8	278.7	>24	0.452
GRB100724A[a d]	2010-07-24	4.2/4.2/4.2	1.0/0.9/0.9	1.5–2.3	0.7	0.2	19.52	1.288
GRB100728B[e]	2010-07-29	7.2/7.2/7.2	1.0/0.9/0.9	1.5–1.1	0.6	22	23	2.106
GRB100814A-1[d]	2010-08-14	0.9/0.9/0.9	1.0/0.9/0.9	1.9–1.7	0.5	0.9	19	1.439
GRB100814A-2	2010-08-14	4.8/4.8/4.8	1.0/0.9/0.9	1.5–1.2	0.7	2.1	19	1.439
GRB100814A-3	2010-08-18	4.8/4.8/4.8	1.0/0.9/0.9	1.2–1.0	0.6	98	20	1.439
GRB100816A[f]	2010-08-17	4.8/4.8/4.8	1.0/0.9/0.9	1.8–1.6	0.8	28.4	21.6	0.805
GRB100901A	2010-09-04	2.4/2.4/2.4	1.0/0.9/0.9	1.5–1.5	1.9	66	>24	1.408
GRB101219A	2010-12-19	7.2/7.2/7.2	1.0/0.9/0.9	1.1–1.7	1.8	3.7	>24	0.718
GRB101219B-1[a]	2010-12-20	4.8/4.8/4.8	1.0/0.9/0.9	1.6–2.6	1.4	11.6	20	0.552
GRB101219B-2[a]	2011-01-05	7.2/7.2/7.2	1.0/0.9/0.9	1.2–2.0	1.0	394	22.7	0.552
GRB101219B-3[a]	2011-01-25	7.2/7.2/7.2	1.0/0.9/0.9	1.4–2.1	0.7	886	>24	0.552
GRB110128A	2011-01-28	7.2/7.2/7.2	1.0/0.9/0.9	2.0–1.6	0.6	5.5	22.5	2.339
GRB110407A	2011-04-08	9.6/9.6/9.6	1.0/0.9/0.9	1.4–1.3	2.1	12.4	23	–
GRB110709B[c]	2013-03-19	7.2/7.2/7.2	1.0/0.9/0.9	1.6–1.1	0.9	14835	>24	2.109
GRB110715A[a]	2011-07-16	0.6/0.6/0.6	1.0/0.9/0.9	1.1–1.1	1.6	12.3	18.5	0.823
GRB110721A[a]	2011-07-22	2.4/2.4/2.4	1.0/0.9/0.9	1.2–1.4	2.3	28.7	>24	0.382
GRB110808A	2011-08-08	2.4/2.4/2.4	1.0/0.9/0.9	1.2–1.1	1.0	3.0	21.2	1.349
GRB110818A	2011-08-19	4.8/4.8/4.8	1.0/0.9/0.9	1.3–1.3	0.9	6.2	22.3	3.36
GRB111005A[a c]	2013-04-01	1.2/1.2/1.2	1.0/0.9/0.9	1.3–1.3	0.7	13052	>24	0.013
GRB111008A-1	2011-10-09	8.8/8.8/8.4	1.0/0.9/0.9	1.1–1.0	1.3	8.5	21	4.990
GRB111008A-2	2011-10-10	8.0/8.0/7.2	1.0/0.9/0.9	1.3–1.0	0.9	20.1	22	4.990
GRB111107A	2011-11-07	4.8/4.8/4.8	1.0/0.9/0.9	1.8–1.5	0.8	5.3	21.5	2.893
GRB111117A[f]	2011-11-19	4.8/4.8/4.8	1.0/0.9/0.9	1.5–1.4	0.7	38	>24	2.211
GRB111123A-1	2011-11-24	6.2/6.6/6.6	1.0/0.9/0.9	1.6–1.1	0.8	12.2	>24	3.152
GRB111123A-2[c]	2013-03-07	2.4/2.4/2.4	1.0/0.9/0.9	1.0–1.0	0.5	11266	>24	3.152
GRB111129A	2011-11-30	3.6/3.6/3.6	1.0/0.9/0.9	1.6–2.1	1.9	8.7	>24	1.080
GRB111209A-1	2011-12-10	4.8/4.8/4.8	1.0/0.9/0.9	1.1–1.2	0.8	17.7	20.1	0.677
GRB111209A-2	2011-12-29	9.6/9.6/9.6	1.0/0.9/0.9	1.2–2.0	1.0	497	23	0.677
GRB111211A[a]	2011-12-13	2.4/2.4/2.4	1.0/0.9/0.9	1.4–1.6	0.6	31	19.5	0.478
GRB111228A	2011-12-29	2.4/2.4/2.4	1.0/0.9/0.9	1.4–1.4	0.7	15.9	20.1	0.716
GRB120118B[c]	2013-02-13	3.6/3.6/3.6	1.0/0.9/0.9	1.1–1.0	0.7	9393	>24	2.943
GRB120119A-1	2012-01-19	2.4/2.4/2.4	1.0/0.9/0.9	1.1–1.1	0.6	1.4	17	1.728
GRB120119A-2	2012-01-19	1.2/1.2/1.2	1.0/0.9/0.9	1.8–1.9	0.5	4.5	20	1.728
GRB120119A-3[c]	2013-02-26	4.8/4.8/4.8	1.0/0.9/0.6JH	1.0–1.1	1.8	9694	>24	1.728
GRB120211A-1[c]	2013-02-17	4.8/4.8/4.8	1.0/0.9/0.9	1.1–1.4	1.3	8919	>24	2.346
GRB120211A-2[c]	2013-03-20	3.6/3.6/3.6	1.0/0.9/0.9	1.1–1.2	1.2	9660	>24	2.346

Table 1. The full sample of afterglows or hosts observed in the program (continued).

GRB	Obs Date	Exptime	Slit width	Airmass	Seeing	Δt	$\mathrm{Mag_{acq}}$	Redshift
		(ks)	(arcsec)		(arcsec)	(hr)		
GRB120224A	2012-02-25	2.4/2.4/2.4	1.0/0.9/0.9	1.7–2.1	1.3	19.8	22.3	1.10
GRB120311A[a]	2012-03-11	2.4/2.4/2.4	1.0/0.9/0.9	1.6–1.4	0.7	3.7	21.6	0.350
GRB120327A-1[a]	2012-03-27	2.4/2.4/2.4	1.0/0.9/0.9	1.6–1.4	0.6	2.1	18.8	2.815
GRB120327A-2[a]	2012-03-28	4.2/4.2/4.2	1.0/0.9/0.9	1.0–1.1	0.6	29	22.5	2.815
GRB120404A	2012-04-05	9.6/9.6/9.6	1.0/0.9/0.9JH	1.7–1.3	1.3	15.7	21.3	2.876
GRB120422A	2012-04-22	4.8/4.8/4.8	1.0/0.9/0.9	1.3–1.3	0.7	16.5	22	0.283
GRB120712A	2012-07-13	4.8/4.8/4.8	1.0/0.9/0.9	1.5–2.5	1.5	10.4	21.5	4.175
GRB120714B	2012-07-15	4.8/4.8/4.8	1.0/0.9/0.9JH	1.5–1.2	1.2	7.8	22.1	0.398
GRB120716A[a]	2012-07-19	3.6/3.6/3.6	1.0/0.9/0.9JH	1.8–2.6	1.1	62	20.9	2.486
GRB120722A[b]	2012-07-22	4.8/4.8/4.8	1.0/0.9/0.9	1.3–1.3	1.2	10.3	23.6	0.959
GRB120805A[b]	2012-08-14	3.6/3.6/3.6	1.0/0.9/0.9JH	1.3–1.7	0.9	218	>24	3.9
GRB120815A[a]	2012-08-15	2.4/2.4/2.4	1.0/0.9/0.9	1.3–1.4	0.7	1.69	18.9	2.358
GRB120909A[d]	2012-09-09	1.2/1.2/1.2	1.0/0.9/0.9	1.6–1.6	1.6	1.7	21	3.929
GRB120923A	2012-09-23	9.6/9.6/9.6	1.0/0.9/0.9JH	1.2–1.4	1.0	18.5	>24	7.84
GRB121024A	2012-10-24	2.4/2.4/2.4	1.0/0.9/0.9	1.2–1.1	0.6	1.8	20	2.300
GRB121027A	2012-10-30	8.4/8.4/8.4	1.0/0.9/0.9	1.3–1.3	1.3	69.4	21.15	1.773
GRB121201A	2012-12-02	4.8/4.8/4.8	1.0/0.9/0.9JH	1.1–1.1	1.1	12.9	23	3.385
GRB121229A	2012-12-29	4.8/4.8/4.8	1.0/0.9/0.9JH	1.4–1.2	1.5	2	21.5	2.707
GRB130131B[c]	2013-03-09	7.2/7.2/7.2	1.0/0.9/0.9JH	1.3–1.6	1.1	874	>24	2.539
GRB130408A[a]	2013-04-08	1.2/1.2/1.2	1.0/0.9/0.9	1.0–1.0	0.9	1.9	20	3.758
GRB130418A	2013-04-18	1.2/1.2/1.2	1.0/0.9/0.9	1.4–1.3	1.2	4.6	18.5	1.222
GRB130427A	2013-04-28	1.2/1.2/1.2	1.0/0.9/0.9JH	1.8–1.8	0.8	16.5	19	0.340
GRB130427B	2013-04-28	1.2/1.2/1.2	1.0/0.9/0.9JH	1.2–1.0	1.0	20.3	22.7	2.780
GRB130603B[f]	2013-06-04	2.4/2.4/2.4	1.0/0.9/0.9	1.4–1.4	1.1	8.2	21.5	0.356
GRB130606A	2013-06-07	4.2/4.2/4.2	1.0/0.9/0.9JH	1.7–1.9	0.9	7.1	19	5.91
GRB130612A	2013-06-12	1.2/1.2/1.2	1.0/0.9/0.9	1.3–1.3	1.5	1.1	21.5	2.006
GRB130615A	2013-06-15	1.2/1.2/1.2	1.0/0.9/0.9	2.1–2.2	1.0	0.8	21	2.9
GRB130701A	2013-07-01	1.2/1.2/1.2	1.0/0.9/0.9JH	2.0–2.0	1.4	5.5	19.9	1.155
GRB130925A	2013-09-25	5.88/6.0/6.9	1.0/0.9/0.9JH	1.0–1.0	0.6	3.5	>24	0.347
GRB131011A[a]	2013-10-13	4.5/4.5/4.5	1.0/0.9/0.9	1.1–1.1	0.8	34.2	>24	1.874
GRB131030A	2013-10-31	3.6/3.6/3.6	1.0/0.9/0.9	1.1–1.1	1.1	3.4	18.0	1.296
GRB131103A	2013-11-05	2.4/2.4/2.4	1.0/0.9/0.9JH	1.1–1.1	1.0	5.8	20.48	0.599
GRB131105A	2013-11-05	4.8/4.8/4.8	1.0/0.9/0.9	1.3–1.4	0.8	1.3	22.4	1.686
GRB131117A	2013-11-17	4.8/4.8/4.8	1.0/0.9/0.9JH	1.3–1.2	1.7	1.1	20	4.042
GRB131231A[a]	2014-01-01	2.4/2.4/2.4	1.0/0.9/0.9JH	1.4–1.3	0.9	20.2	18.5	0.642
GRB140114A[c]	2014-03-28	5.4/5.4/5.4	1.0/0.9/0.9JH	1.7–1.7	1.2	1746	>24	3.0
GRB140213A[a]	2014-02-14	1.2/1.2/1.2	1.0/0.9/0.9JH	1.5–1.5	0.7	5.8	19.5	1.208
GRB140301A	2014-03-02	7.2/7.2/7.2	1.0/0.9/0.9JH	1.1–1.1	0.9	9	23.1	1.416
GRB140311A[a]	2014-03-13	7.6/6.3/8.4	1.0/0.9/0.9JH	1.2–1.2	0.6	32.5	>24	4.954
GRB140430A[a]	2014-04-30	1.2/1.2/1.2	1.0/0.9/0.9	2.0–1.8	1.6	2.5	19	1.601
GRB140506A-1	2014-05-07	4.8/4.8/4.8	1.0/0.9/0.9	1.3–1.4	0.7	8.8	20.9	0.889
GRB140506A-2	2014-05-08	4.8/4.8/4.8	1.0/0.9/0.9	1.2–1.3	0.7	32.9		0.889
GRB140515A	2014-05-16	4.8/4.8/4.8	1.0/0.9/0.9	1.3–1.3	1.4	15.5	>24	6.327
GRB140614A	2014-06-14	2.4/2.4/2.4	1.0/0.9/0.9	1.8–1.8	0.7	3.8	21.5	4.233
GRB140622A[f]	2014-06-22	1.2/1.2/1.2	1.0/0.9/0.9	1.4–1.3	1.0	0.8	>24	0.959
GRB141028A[a]	2014-10-29	2.4/2.4/2.4	1.0/0.9/0.9	1.5–1.4	1.0	15.4	20	2.332
GRB141031A[a c]	2015-01-29	2.4/2.4/2.4	1.0/0.9/0.9	1.2–1.3	0.8	10912	>24	–
GRB141109A-1	2014-11-09	2.4/2.4/2.4	1.0/0.9/0.9JH	1.5–1.7	0.8	1.9	19.2	2.993
GRB141109A-2	2014-11-10	4.3/4.3/4.5	1.0/0.9/0.9JH	1.7–2.0	0.8	25.4		2.993
GRB150206A[a]	2015-02-07	2.4/2.4/2.4	1.0/0.9/0.9	2.1–1.9	0.8	10	21.9	2.087
GRB150301B	2015-03-02	3.6/3.6/3.6	1.0/0.9/0.9JH	1.2–1.2	1.1	5.1	21.0	1.517
GRB150403A	2015-04-04	2.4/2.4/2.4	1.0/0.9/0.9	1.6–1.7	0.7	10.8	19.1	2.057
GRB150423A[d f]	2015-04-23	4.8/4.8/4.8	1.0/0.9/0.9	2.7–2.4	1.4	0.4	>24	1.394
GRB150428A	2015-04-28	2.4/2.4/2.4	1.0/0.9/0.9JH	1.6–1.5	0.8	3.7	>24	–
GRB150514A[a]	2015-05-15	2.4/2.4/2.4	1.0/0.9/0.9	2.3–2.1	0.9	28.4	19.5	0.807
GRB150518A[a]	2015-05-20	2.4/2.4/2.4	1.0/0.9/0.9JH	1.3–1.3	1.7	30.7	>24	0.256
GRB150616A[a c]	2015-09-12	2.4/2.4/2.4	1.0/0.9/0.9JH	1.2–1.1	1.2	2092	>24	1.188
GRB150727A	2015-07-28	3.6/3.6/3.6	1.0/0.9/0.9JH	1.2–1.2	1.4	5.0	20.5	0.313
GRB150821A[d]	2015-08-21	2.4/2.4/2.4	1.0/0.9/0.9	2.0–1.8	1.3	0.2	16	0.755

Table 1. The full sample of afterglows or hosts observed in the program (continued).

GRB	Obs Date	Exptime (ks)	Slit width (arcsec)	Airmass	Seeing (arcsec)	Δt (hr)	$\mathrm{Mag}_{\mathrm{acq}}$	Redshift
GRB150910A	2015-09-11	1.8/1.8/1.8	1.0/0.9/0.9JH	1.9–1.9	1.3	20.1	21.2	1.359
GRB150915A	2015-09-16	4.8/4.8/4.8	1.0/0.9/0.9JH	1.1–1.1	1.6	3.3	23	1.968
GRB151021A[d]	2015-10-21	4.2/4.2/4.2	1.0/0.9/0.9	1.0–1.1	1.4	0.75	18.2	2.330
GRB151027B	2015-10-28	2.4/2.4/2.4	1.0/0.9/0.9JH	1.5–1.7	1.2	5	20.5	4.063
GRB151029A	2015-10-29	1.2/1.2/1.2	1.0/0.9/0.9JH	1.9–1.7	1.1	1	20	1.423
GRB151031A[d]	2015-10-31	4.2/4.2/4.2	1.0/0.9/0.9	1.1–1.1	1.1	0.3	20.4	1.167
GRB160117B	2016-01-18	4.8/4.8/4.8	1.0/0.9/0.9JH	1.1–1.2	1.1	13.5	20.8	0.870
GRB160203A[d]	2016-02-03	6.6/6.6/6.6	1.0/0.9/0.9	1.0–1.8	1.0	0.3	18	3.518
GRB160228A[c]	2016-03-12	4.8/4.8/4.8	1.0/0.9/0.9JH	1.7–1.7	1.0	296	>24	1.640
GRB160303A[f]	2016-03-04	4.8/4.8/4.8	1.0/0.9/0.9JH	1.6–1.5	0.8	19.1	>24	–
GRB160314A	2016-03-15	4.8/4.8/4.8	1.0/0.9/0.9JH	1.3–1.3	0.8	13.0	21.7	0.726
GRB160410A[d f]	2016-04-10	1.8/1.8/1.8	1.0/0.9/0.9	2.5–2.3	0.5	0.15	20.3	1.717
GRB160425A	2016-04-26	4.8/4.8/4.8	1.0/0.9/0.9JH	1.3–1.3	0.5	7.2	21.1	0.555
GRB160625B[a]	2016-06-27	2.4/2.4/2.4	1.0/0.9/0.9JH	1.3–1.3	0.7	30	19.1	1.406
GRB160804A-1[a]	2016-08-04	2.4/2.4/2.4	1.0/0.9/0.9JH	1.4–1.3	0.6	22.4	21.2	0.736
GRB160804A-2[a c]	2016-08-27	3.6/3.6/3.6	1.0/0.9/0.9JH	1.9–1.8	0.6	574	>24	0.736
GRB161001A	2016-10-01	2.4/2.4/2.4	1.0/0.9/0.9JH	1.2–1.3	0.5	6.1	>24	0.891
GRB161007A[c]	2016-10-14	2.4/2.4/2.4	1.0/0.9/0.9JH	1.6–1.6	0.7	323	>24	–
GRB161014A	2016-10-15	4.8/4.8/4.8	1.0/0.9/0.9JH	1.1–1.2	0.5	11.6	21.4	2.823
GRB161023A[a]	2016-10-24	1.2/1.2/1.2	1.0/0.9/0.9JH	1.2–1.2	0.9	3	17.5	2.710
GRB161117A	2016-11-17	2.4/2.4/2.4	1.0/0.9/0.9	1.8–1.6	2.6	0.73	19	1.549
GRB161219B	2016-12-21	2.4/2.4/2.4	1.0/0.9/0.9JH	1.1–1.1	0.9	35.7	19.5	0.146
GRB170113A	2017-01-14	4.8/4.8/4.8	1.0/0.9/0.9JH	1.5–1.4	0.9	15.23	21.7	1.968
GRB170202A	2017-02-03	2.4/2.4/2.4	1.0/0.9/0.9JH	1.3–1.2	0.7	9.7	20.8	3.645

Notes. [(a)] Not part of the statistical sample [(b)] Spectrum dominated by light from the host galaxy [(c)] Spectrum of the host galaxy taken long after the burst [(d)] RRM observation [(e)] ADC malfunction during observation [(f)] Short burst

Fig 2. Redshift distribution as a function of intrinsic BAT gamma-ray energy. Bursts that are a part of the statistical sample are marked by blue stars whereas black dots show all GRBs observed with X-shooter. All Swift~GRBs with measured redshifts are shown in grey.

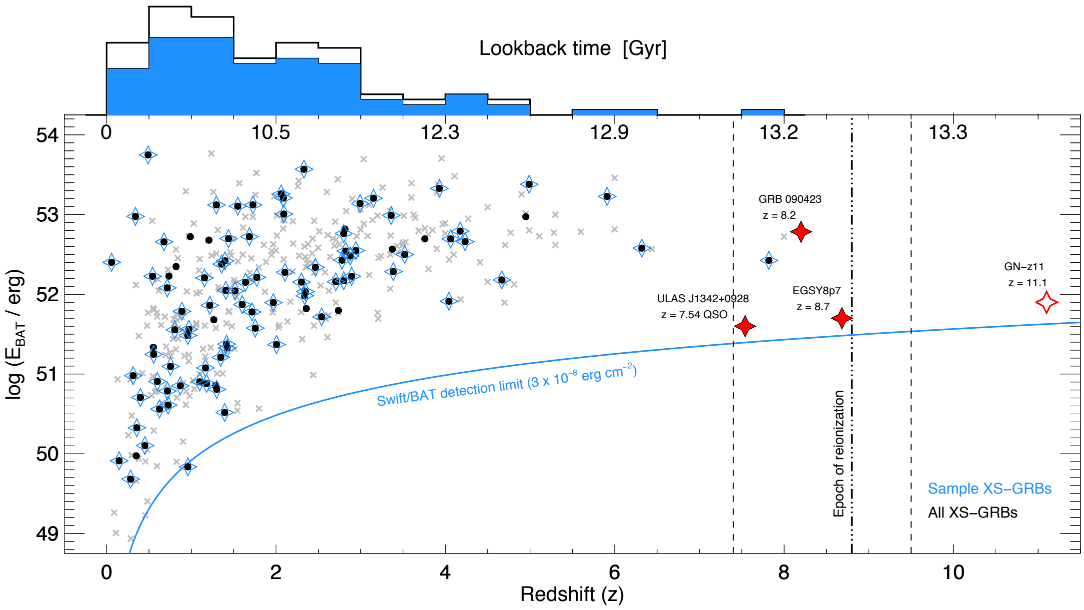
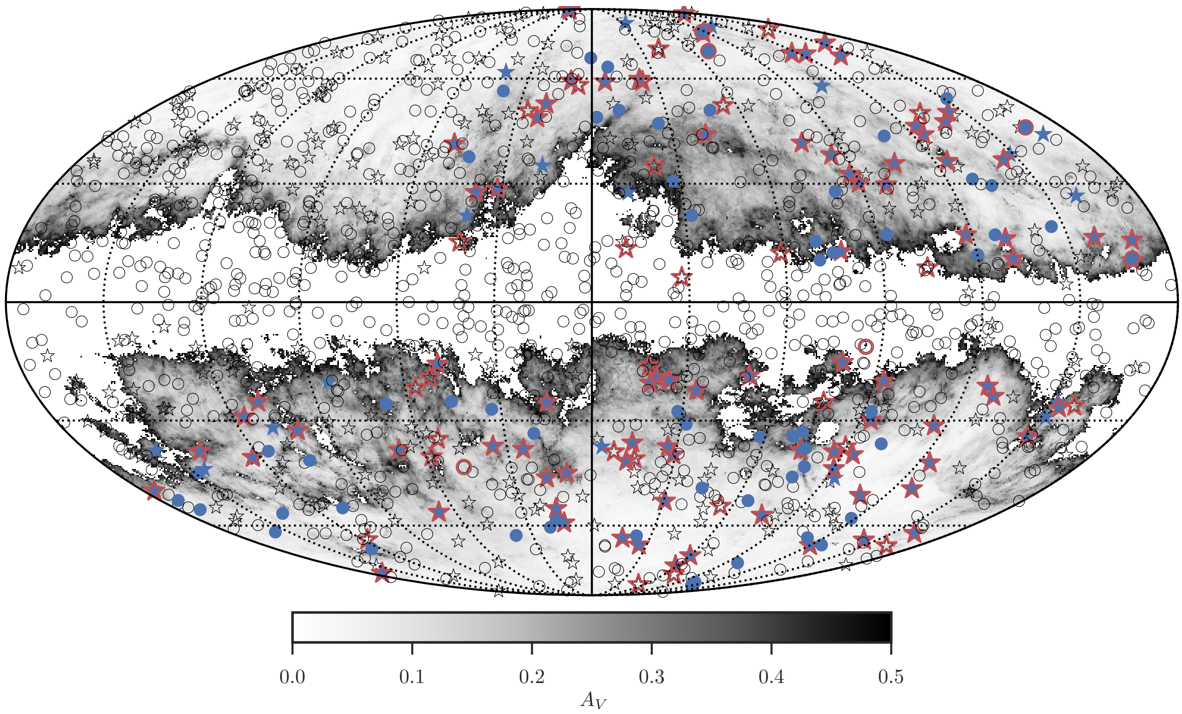


Fig 3. Sky distribution for all the GRB released here. The positions of the bursts released are indicated by red symbols.



For each burst, each individual observation is provided in a separate reduction, and in cases where observations have been repeated for an increased signal-to-noise or to follow the temporal evolution, a combined spectrum is also provided. No attempt has been made to join the spectroscopic arms, so for each observation, three spectra are provided in separate files. A telluric correction estimate is included for all bursts along with an estimate of the continuum.

A total of 122 bursts have been followed, with 103 being within 48 hours of the GRB explosion. A wide range of afterglow brightness and observation conditions are present.

Release Notes

Data Reduction and Calibration

All spectra have been reduced with the ESO X-shooter pipeline version 2.5.3 through 2.93. The observations are reduced in STARE mode and then combined in post processing steps. The pipeline is managed with the Reflex interface and is used for subtraction of bias level, flat-fielding, tracing of the echelle orders, wavelength calibrations with the use of arc-line lamps, flux calibration using spectrophotometric standards, mirror flexure compensation, sky-subtraction and lastly the rectification and merging of the orders. Errors and bad pixel maps are propagated throughout the extraction. For the initial sky-subtraction, the background has been estimated by a running median in regions adjacent to the object trace clear of contaminating sources. Due to the broken ADC, for some objects there is curvature in the object trace along the dispersion axis of the slit. This means that for these bursts, the initial sky-estimate was made from a limited number of pixels in the spatial direction. The subtraction of the sky background on the un-rectified image ensures that the bulk of the sky background is not redistributed by the rectification process. All wavelength are moved to the barycentric frame and transformed to vacuum wavelengths. Slit losses affects all observation and no attempt to correct for this has been implemented. This can be done on a target-by-target basis using the header keywords. All spectra have been corrected for Galactic extinction using the E(B-V) value from the dust maps of Schlegel et al (1998) with the update in Schlafly et al. (2011), and the extinction curve by Cardelli et al. (1989) with a total to selective extinction $R_V = 3.1$.

Data Quality

The data quality ranges from excellent, high S/N spectra to ones that are essentially just noise. Everything is included here for completeness. Some observation are taken during twilight and some during poor observing conditions. Because the observations are time-critical, actually getting the observations have been of top priority.

A description of the completeness of the data presented here is presented in Selsing et al., arXiv:1802.07727

Known issues

The flux calibration of the spectra are carried out arm-by-arm. Because the seeing is wavelength dependent, the slit-losses affects the different arms differently. Offsets between the arms are therefore observed. Only a single burst is affected by the failing ADC (GRB100728B) leading to a lower-than nominal throughput.

In some cases there are significant background contamination. This is in many cases due to a complicated field or bright hosts. This will in some cases lead to an over subtraction of the background.

Data Format

Files Types

All spectra are released in the ESO Science Data Product (SDP) format, and formatted as binary FITS files. The naming convention is based on the GRB name and the observation number, and follow the scheme GRBxxxxxxx_OBxarm.fits. For example, the visual arm of the third observation of GRB 151021A, observed in RRM mode, is named GRB151021A_OB3VIS.fits.

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