TITLE: GCN GRB OBSERVATION REPORT
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SUBJECT: GRB 001109: deep JHK upper limits
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We observed the field of GRB 001109 [1] in J, H and Ks with INGRID on the 4.2m William Herschel Telescope on La Palma, Canary Islands on Nov. 9.8 and 11.8 UT, respectively 10 and 59 hours after the burst. The 50" radius error circle of the reported X-ray afterglow of GRB 001109 [2] is located at the center of our 4.2'x4.2' images.

We observed the UKIRT faint standard #30 [see 3] to calibrate the field. The stellar FWHM in the co-added frames ranges from 0.9" to 1.3" (pixelsize=0.25"). The first table below shows the log of the observations, including the estimated 3-sigma limiting magnitude (using an aperture diameter twice the size of the FWHM).

At the position of the radio source detected in the field [4], we observe extended emission, consisting of a bright component (with a PSF FWHM significantly larger than that of point sources in the field), and a fainter peak, separated by roughly 1". The magnitudes that we measure for this emission (using an aperture radius of 2.5"), are also listed in the table. Within the errors (which do not include the uncertainty in the calibration), this source does not vary. This confirms the expectation [5] that the emission from this location is probably not related to the GRB.

UT date	filter	exptime	lim. mag.	radio source
2000 Nov. 9.81	J	300s	21.3	18.64 (0.05)
9.80	H	750s	21.0	17.96 (0.03)
9.79	Ks	750s	19.9	16.96 (0.04)
11.86	J	600s	21.4	18.70 (0.05)
11.82	H	600s	20.7	17.93 (0.08)

	11.83	Ks	600s	19.4	17.07 (0.07)

Furthermore, after close inspection of the images by eye and by comparing the aperture magnitudes of all the detectable objects between the two epochs, we do not find an afterglow candidate.

To our knowledge, our images present the deepest near-infrared upper limit on a GRB afterglow brightness to date. The table below shows all GRB afterglow near-IR detections and upper limits (that we could find) with observations performed within 3 days of the burst occurrence. It is clear that our early deep observations would have easily discovered any of the detections in the table, and that they are both earlier and deeper than the reported upper limits. This result suggests that at least some bursts are intrinsically faint in the near-IR and that the dust obscuration explanation for the GRB afterglow non-detections in the optical may not be valid in all cases, unless this burst occurred at a redshift large enough for the optical/UV extinction in the rest frame to move into the K band regime in the observer's frame.

GRB	magnitude	hrs. since burst	reference
971214	J=20.3	11	[6]
980329	J~19.2	16	[7]
980703	H=17.6	30	[8]
990123	K=18.3	29	[9]
990510	J=17.1, H=16.4, K=16.6	14	[10]
990705	H=16.6	7	[11]
991216	J=16.8, K=15	13	[12]
	H=17.2	35	[13]
000214	K>18.2	32	[14]
000301C	K~17.4	50	[15]
000418	K~17.5	60	[16]
000516	J>20.5, K>17.5	17	[17]
000615	H>20.5	17	[18]
000926	K~19	72	[19]

Finally, we estimate a rough optical upper limit by extrapolating our H band upper limit to the R band, assuming a typical unreddened afterglow spectrum with a slope of -0.8, obtaining R > 23.1. Extinction intrinsic to the burster host galaxy is not included, which

can substantially increase this R band limit.

References:

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