SMARTS SNe observations of GRB 030329 and GRB 031203

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SMARTS 1.3m

- Service/queue telescope
- On-site observer
- Interruptible queue allows for target-of-opportunity observations
- Accessible data
- Simultaneous optical/NIR imaging
- Observing time available is ~3 hours/night for 50 nights per semester
ANICAM

→ Simultaneous optical/NIR imaging

Optical: Fairchild 447 2048x2048 CCD, 6’ x 6’ (UBVRI)
NIR: 1024x1024 HgCdTe Array, 2.4’ x 2.4’ (JHKY)
SMARTS niche

- GRB ToO program NOT intended for extremely rapid response
- Good depth achievable with 1.3m aperture
- Well-sampled, long-term coverage
- Opportunity to build a consistent dataset

FOCUS ON:
1) Bright, long-lived afterglows (e.g. GRB 030329)
2) Long-term coverage of SNe associated with local GRBs (e.g. GRB 031203)
GRB 030329, SN 2003dh

Multi-wavelength light curves

Galactic + host reddening = deviation from power-law

GRB 030329, SN 2003dh

Color evolution of afterglow
= emergence of SN

- V-I, I-J and V-H become bluer
- B-V becomes redder
→ SN spectrum peaks ~5000-6000Å

Δ$J = 0.29 \pm 0.04$

$I$ magnitude of host = 19.21 ± 0.01

$J$ magnitude of host = 18.29 ± 0.03

Δ$I = 0.22 \pm 0.03$ mag

Bailyn et al. 2003, GCN 2486
Tagliaferri et al. 2004, GCN 2545

• Cobb et al.
• Malesani et al. - 0.1 mag
• Thomsen et al.

I magnitude of host = 19.21 ± 0.01

• Cobb et al.
• Malesani et al.

$J$ magnitude of host = 18.29 ± 0.03
GRB 031203, SN 2003lw

The SN occurred within 300 $h_{71}^{-1}$ pc ($3\sigma$) of the apparent host center
GRB 031203, SN 2003lw

→ Comparison of 2003lw and 1998bw

Galactic extinction assumed to be $E(B-V) = 0.78$

If a higher extinction is assumed, SN 2003lw is ~0.5 mag brighter than SN 1998bw
## GRB afterglow upper limits

<table>
<thead>
<tr>
<th>GRB 040223 (16.7 hrs)</th>
<th>GRB 040323 (12.5 hrs)</th>
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</thead>
<tbody>
<tr>
<td>B &gt; 21.5 (error ~ ±0.1)</td>
<td>B &gt; 21.7</td>
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<tr>
<td>V &gt; 20.5</td>
<td>V &gt; 20.5</td>
</tr>
<tr>
<td>R &gt; 20.8</td>
<td>R &gt; 20.5</td>
</tr>
<tr>
<td>I &gt; 20.2</td>
<td>I &gt; 20.1</td>
</tr>
<tr>
<td>J &gt; 17.6</td>
<td>J &gt; 17.4</td>
</tr>
<tr>
<td>H &gt; 17.4</td>
<td>H &gt; 17.1</td>
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<tr>
<td>K &gt; 17.4</td>
<td>K &gt; 16.0</td>
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</tbody>
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<tr>
<th>GRB 040228 (28.3 hrs)</th>
<th>GRB 040511 (10.8 hrs)</th>
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</thead>
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<tr>
<td>B &gt; 21.4</td>
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</tr>
<tr>
<td>V &gt; 20.6</td>
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Future Work

→ Swift-era follow-up imaging!