

Host Galaxies of Long GRBs

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~~LP (Large Programme) sample~~

TOUGH sample

The Optically Unbiased GRB Host



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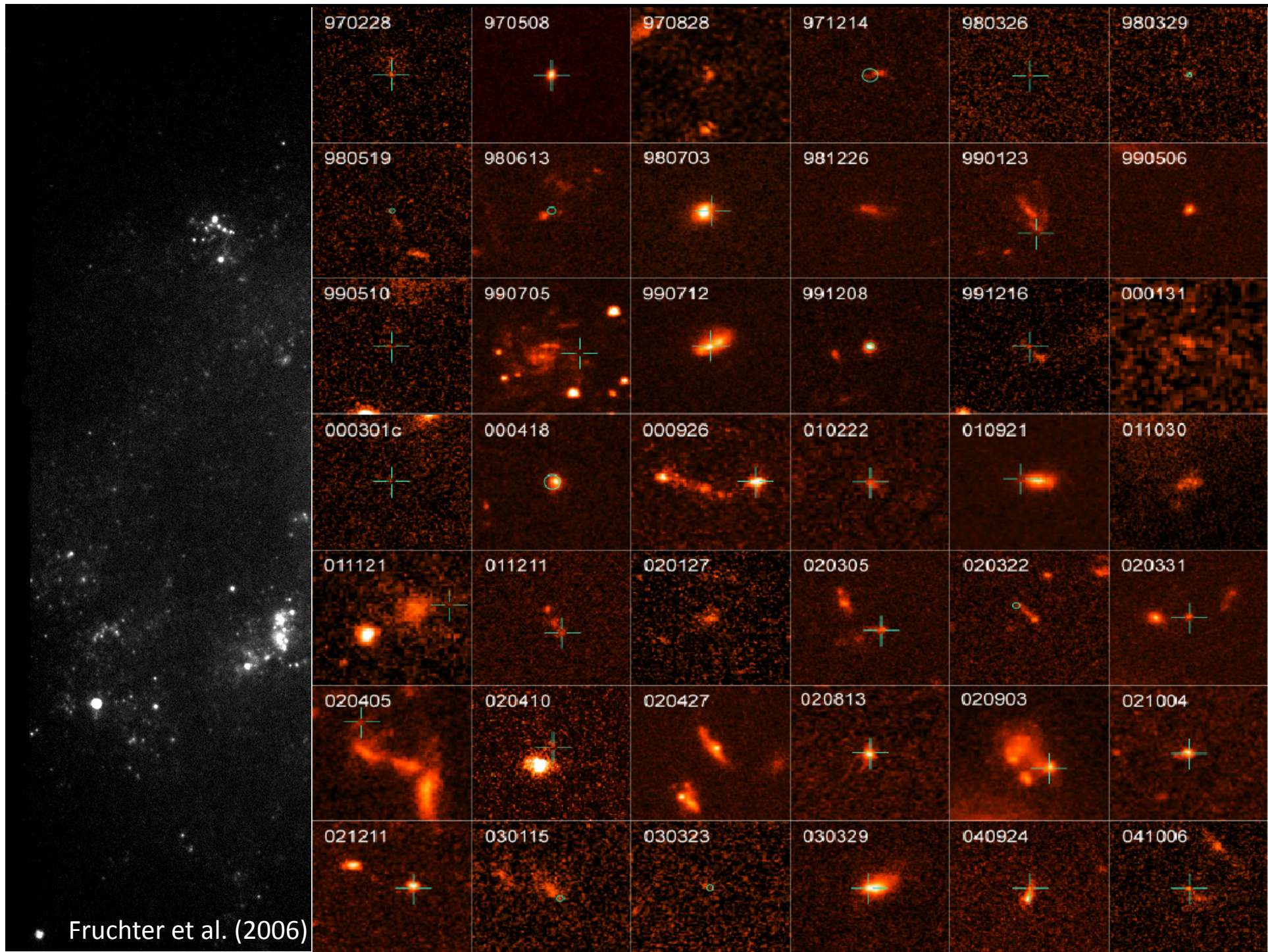
Bo Milvang-Jensen



Bob Chapman

Nial Tanvir





TOUGH sample selection criteria

1. A Swift-detected GRB with $t_{90} > 2$ s.
2. XRT afterglow position distributed within 12 hours.
3. Small foreground Galactic extinction: $A_V < 0.5$ mag.
4. Favorable declination: $-70^\circ < \delta < 27^\circ$.
5. Afterglow error radius $< 2''$.

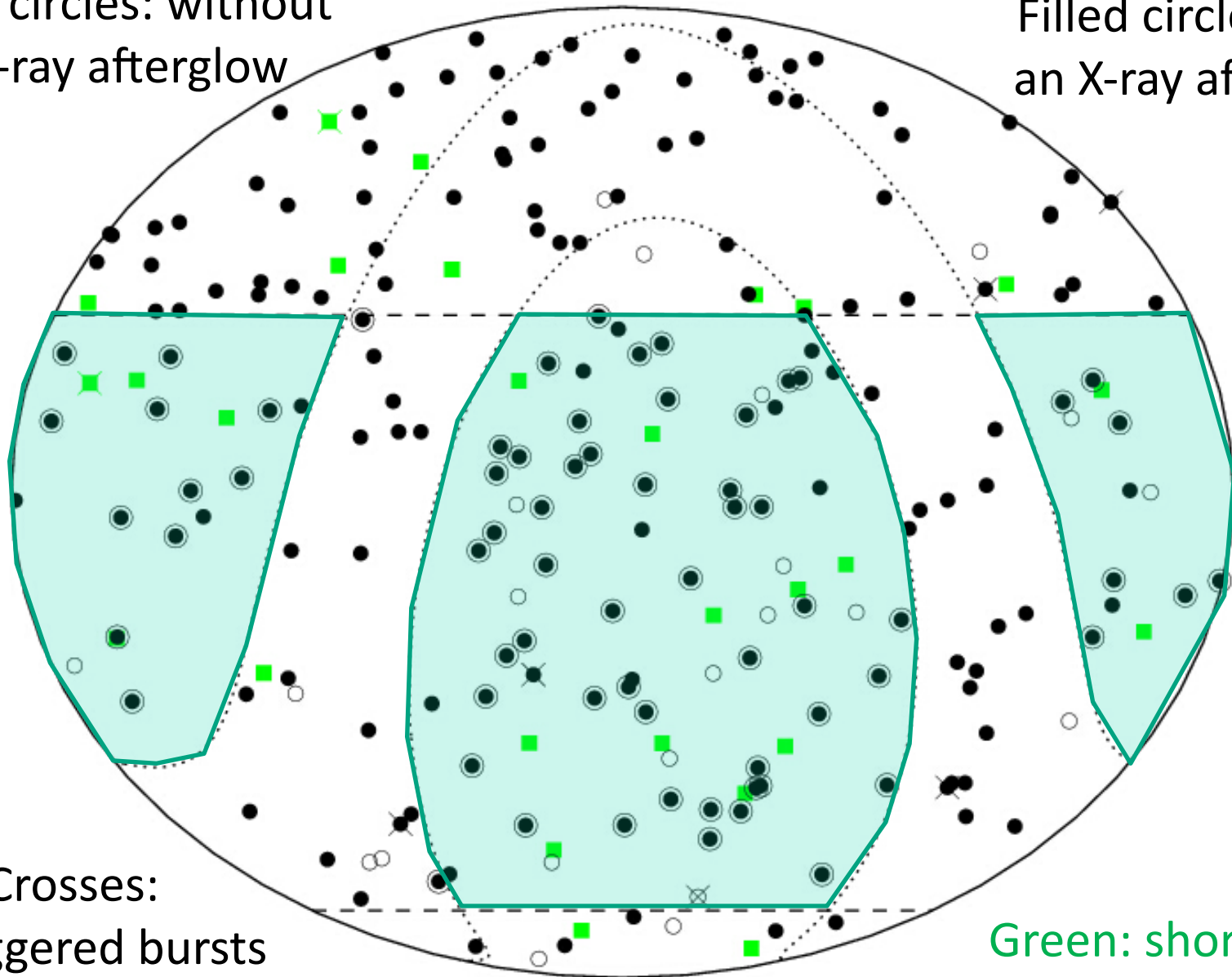
March 2005 - August 2007: 68 GRBs

80% have an optical/NIR afterglow
57% have a reported redshift (39/68)

Sample selection: sky map

Empty circles: without
an X-ray afterglow

Filled circles: with
an X-ray afterglow

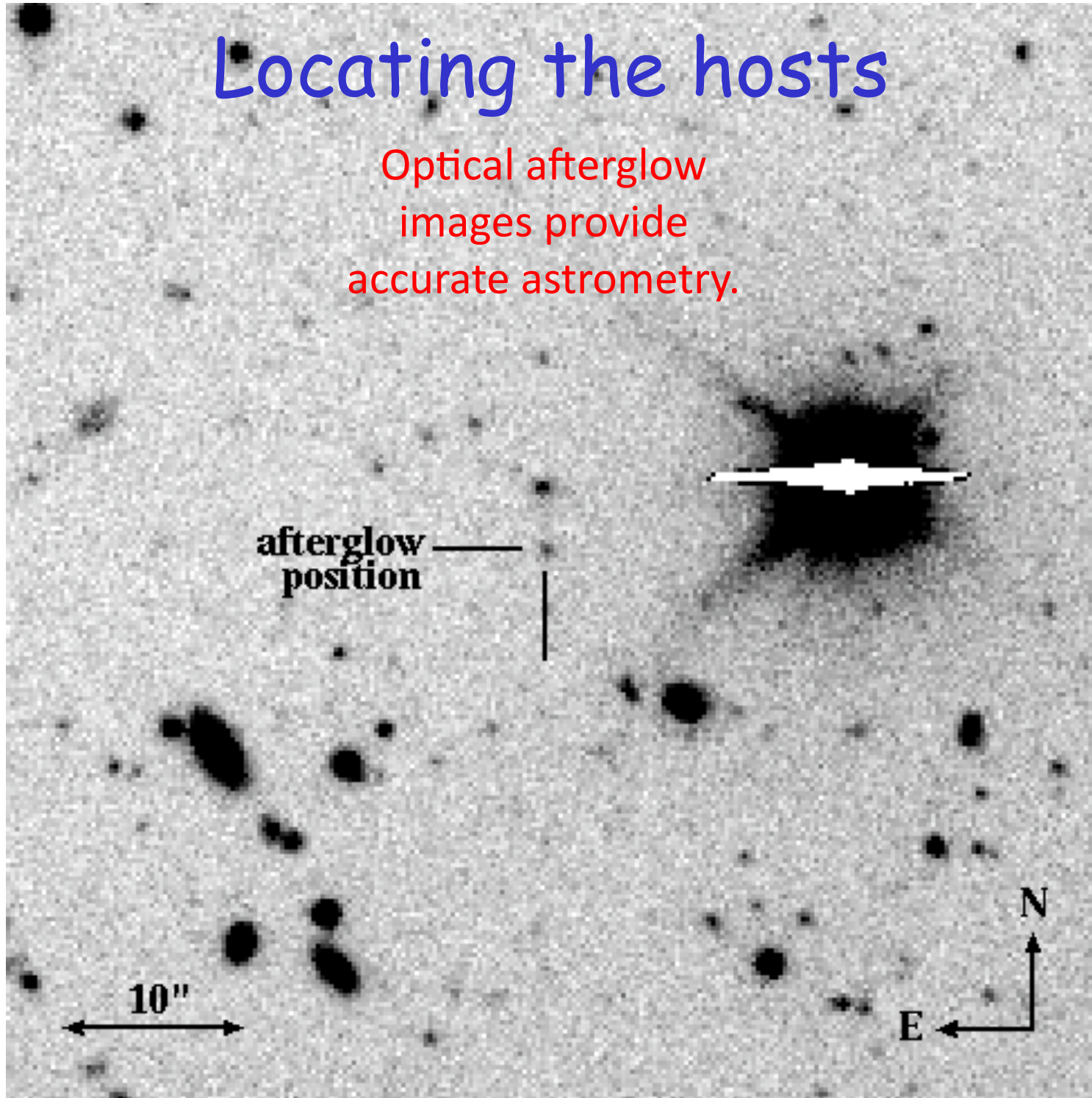


Crosses:
untriggered bursts

Green: short bursts

Locating the hosts

Optical afterglow
images provide
accurate astrometry.



Locating the hosts

X-ray position is usually
good enough.

X-ray error circle

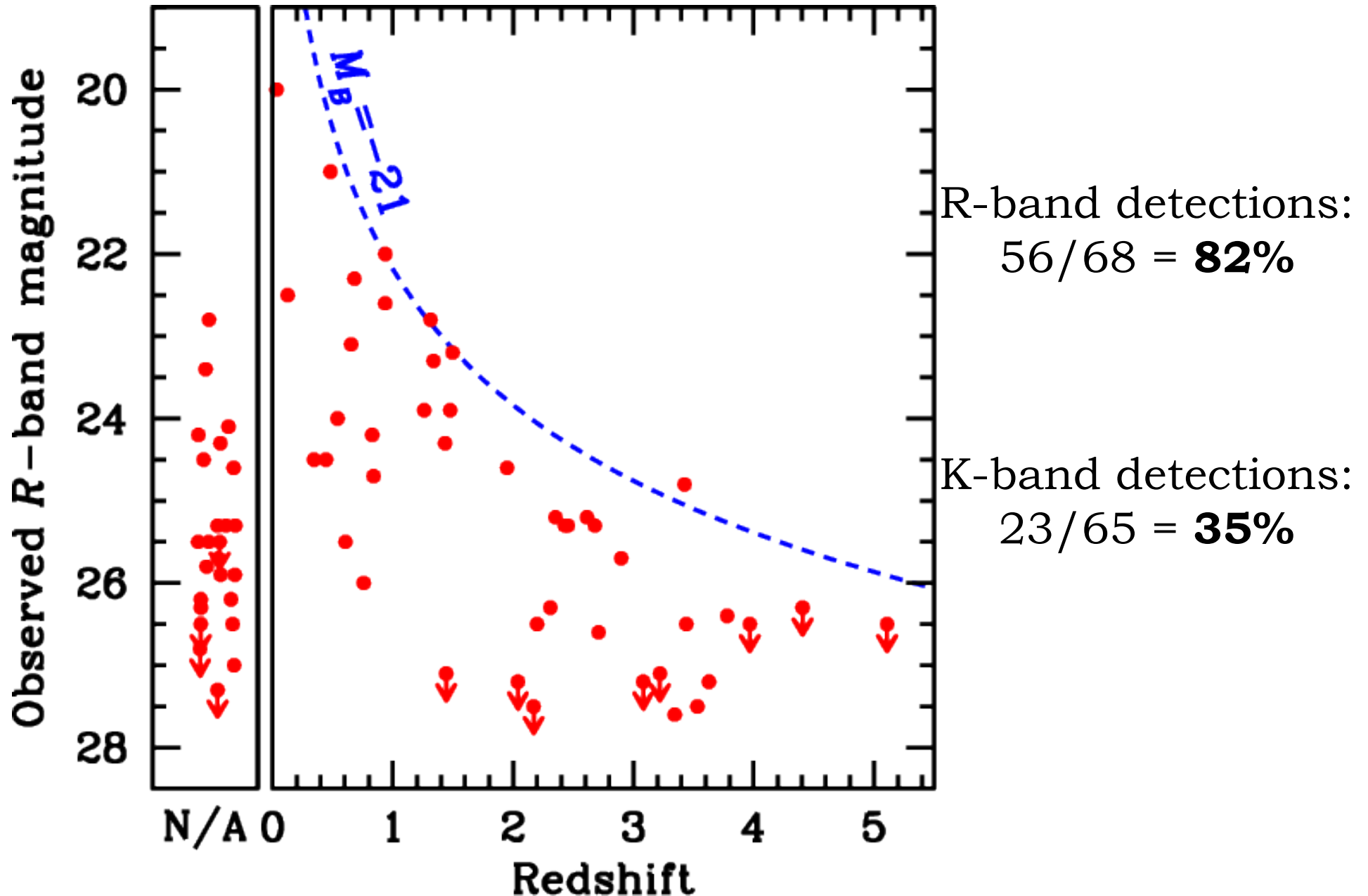


candidate host

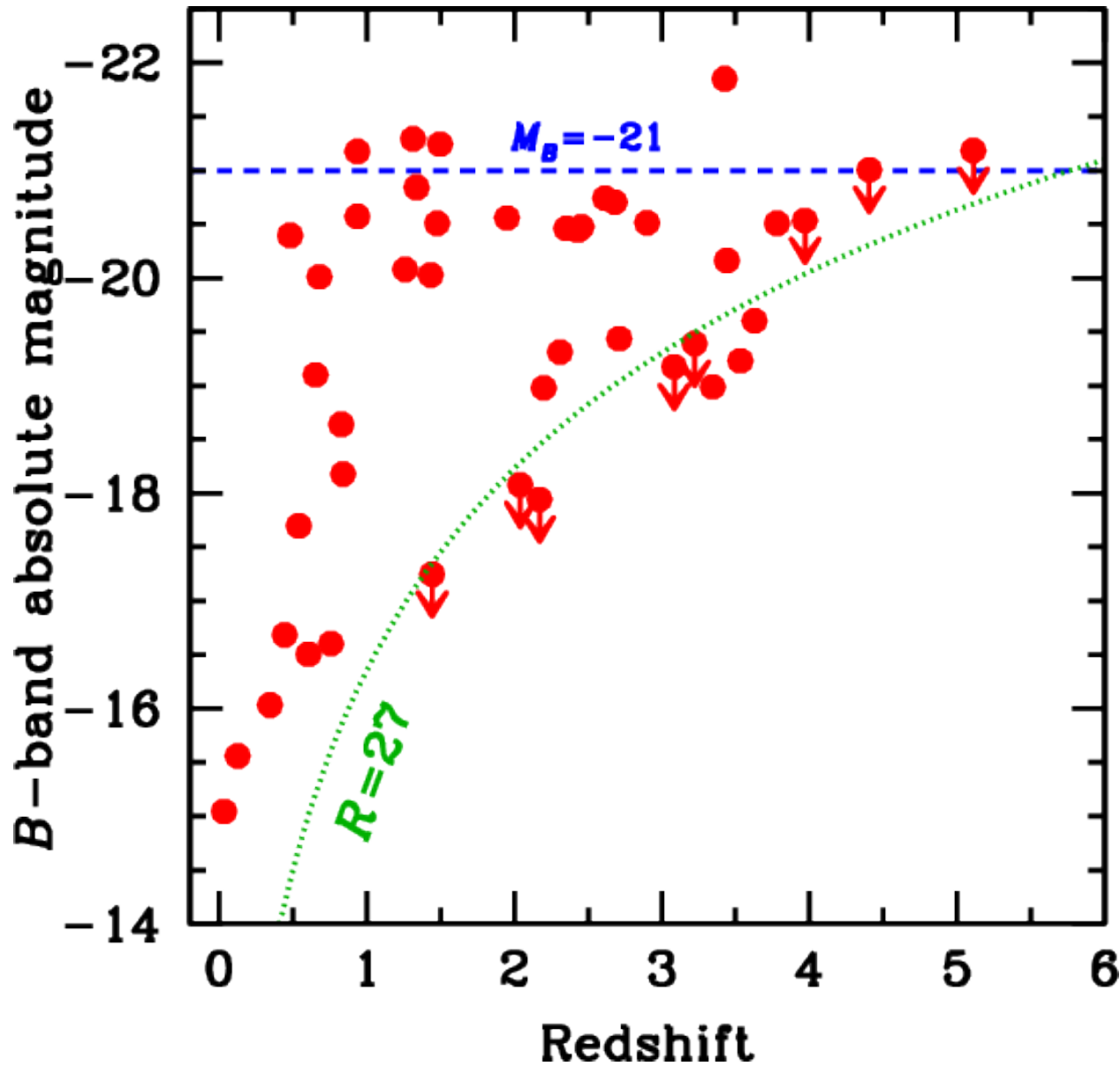
10"



How many detected?



Host properties

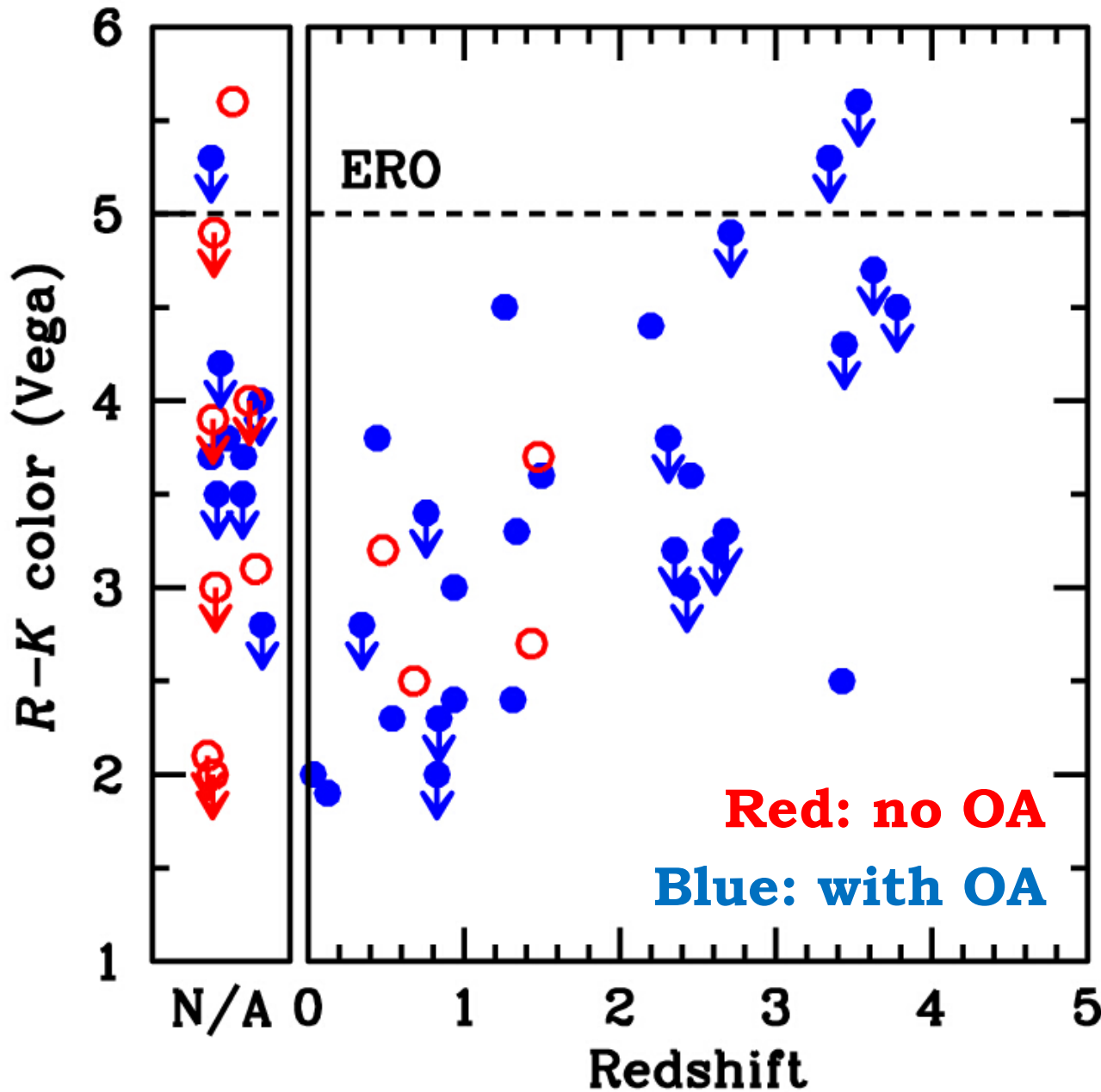


$$-15 > M_B > -22$$

GRB hosts are
mostly subluminal

In line with previous
findings based on
smaller and less
complete samples

Host properties

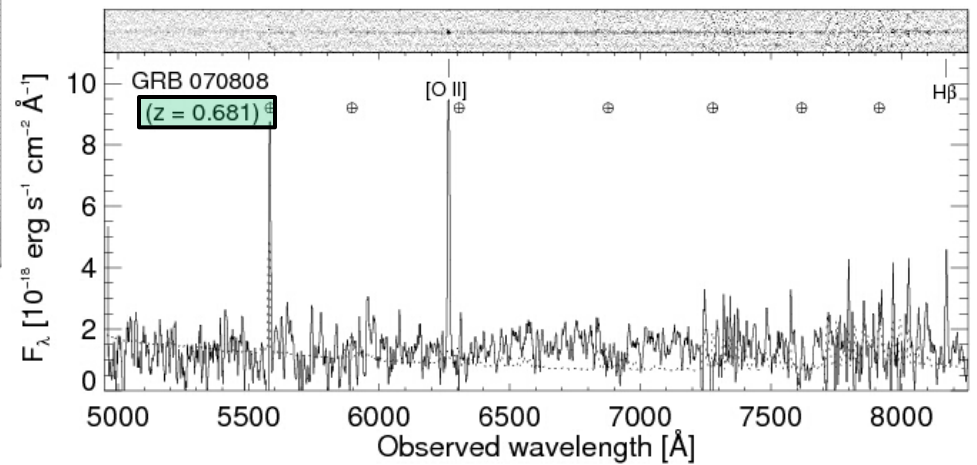
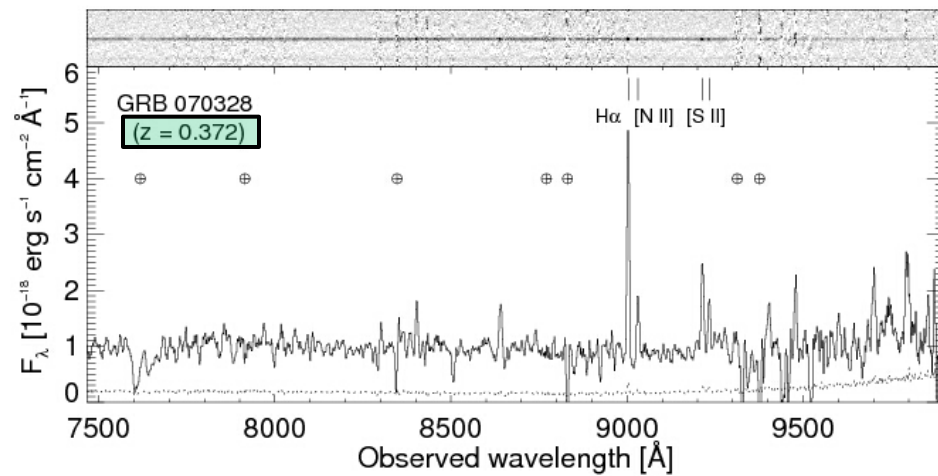
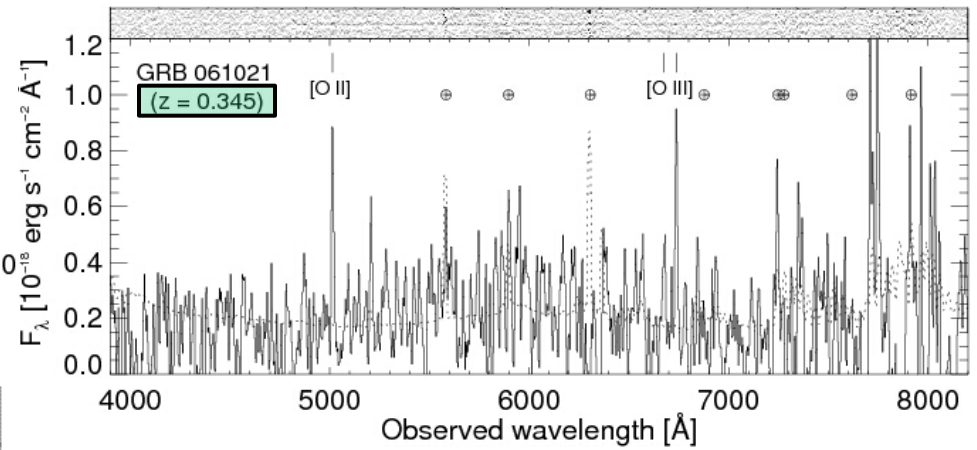
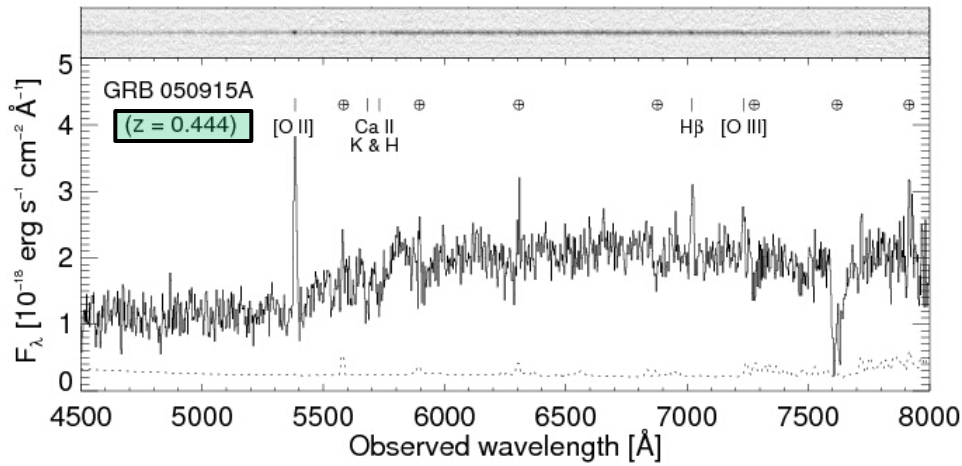


Blue colours:
 $\langle R - K \rangle \sim 3$

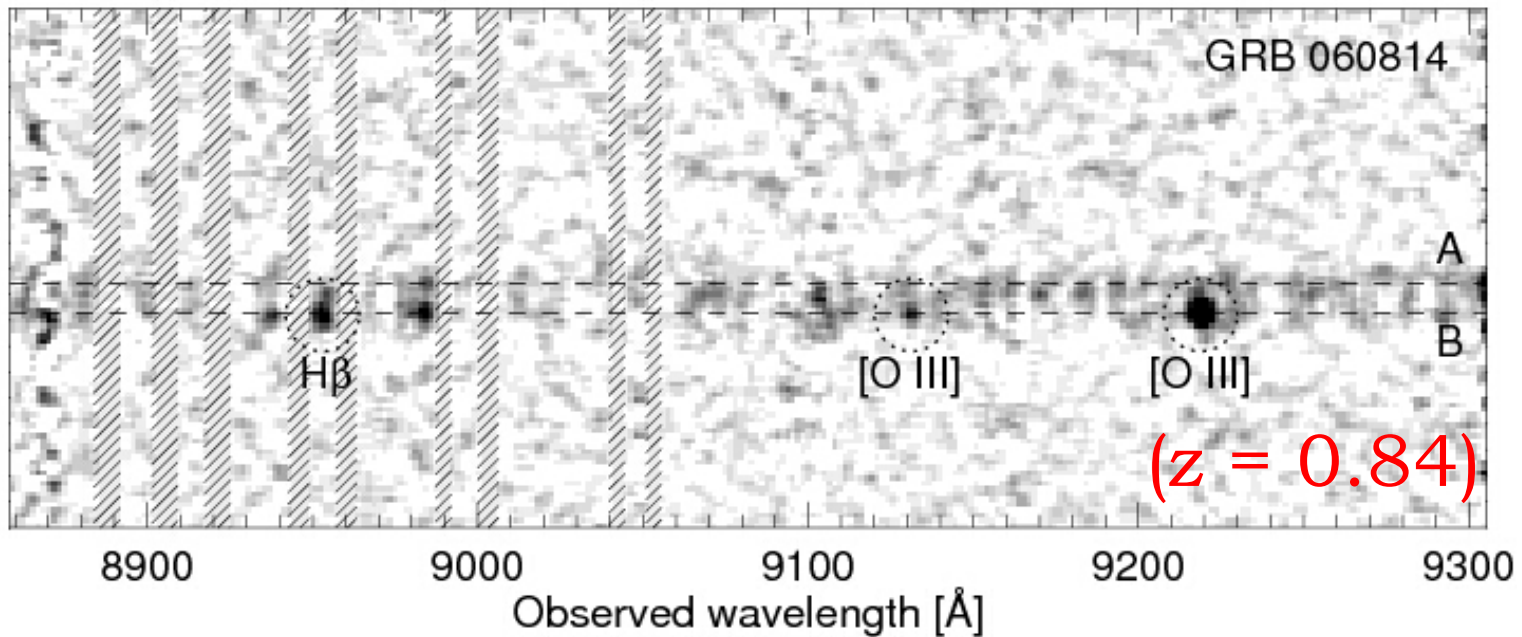
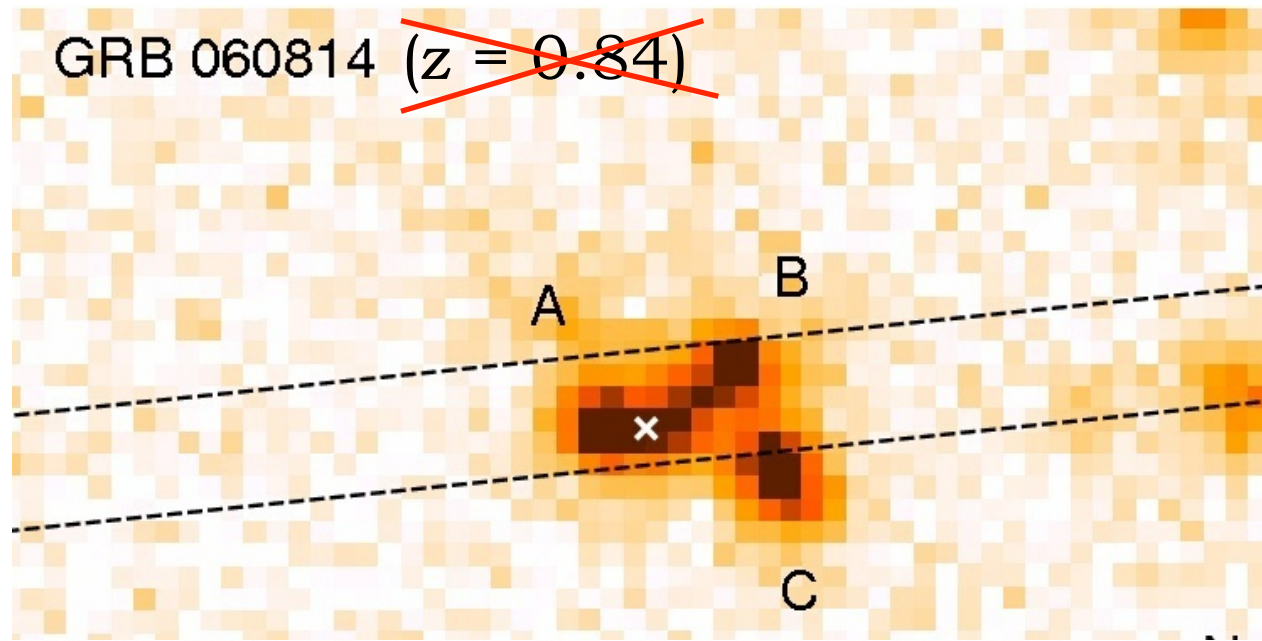
Only 1/56 ERO

Tanvir et al. (2008)
Jaunsen et al. (2008)
Perley et al. (2009)
Levesque et al. (2010)

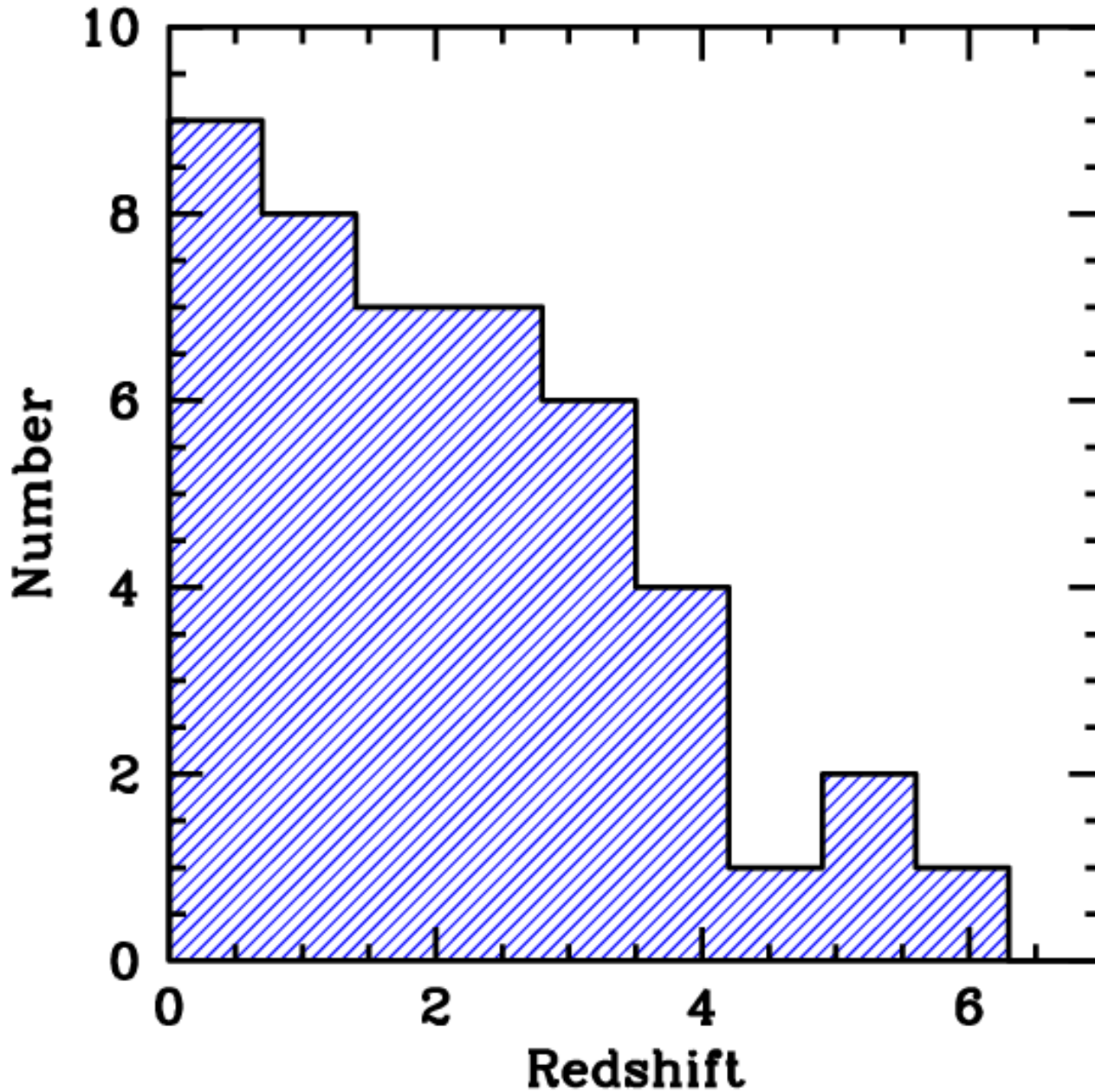
Redshift determination ($R < 25$ mag)



Redshift determination



Redshift distribution



Before TOUGH:

$$\langle z \rangle = 2.39$$

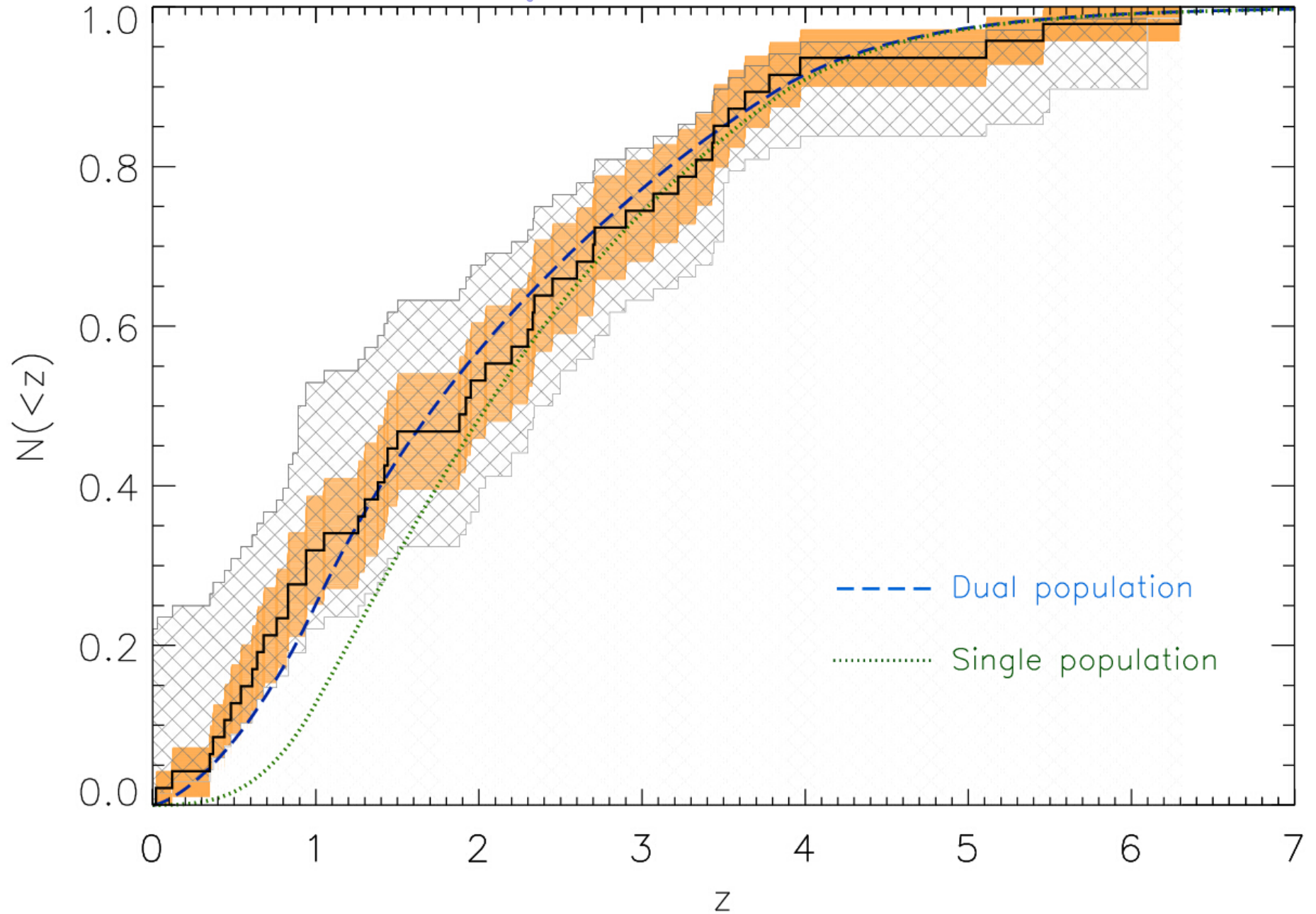
After TOUGH:

$$\langle z \rangle = 2.13$$

10 new
redshifts

All 68 hosts
have a redshift
constraint

Redshift distribution



Legacy value

