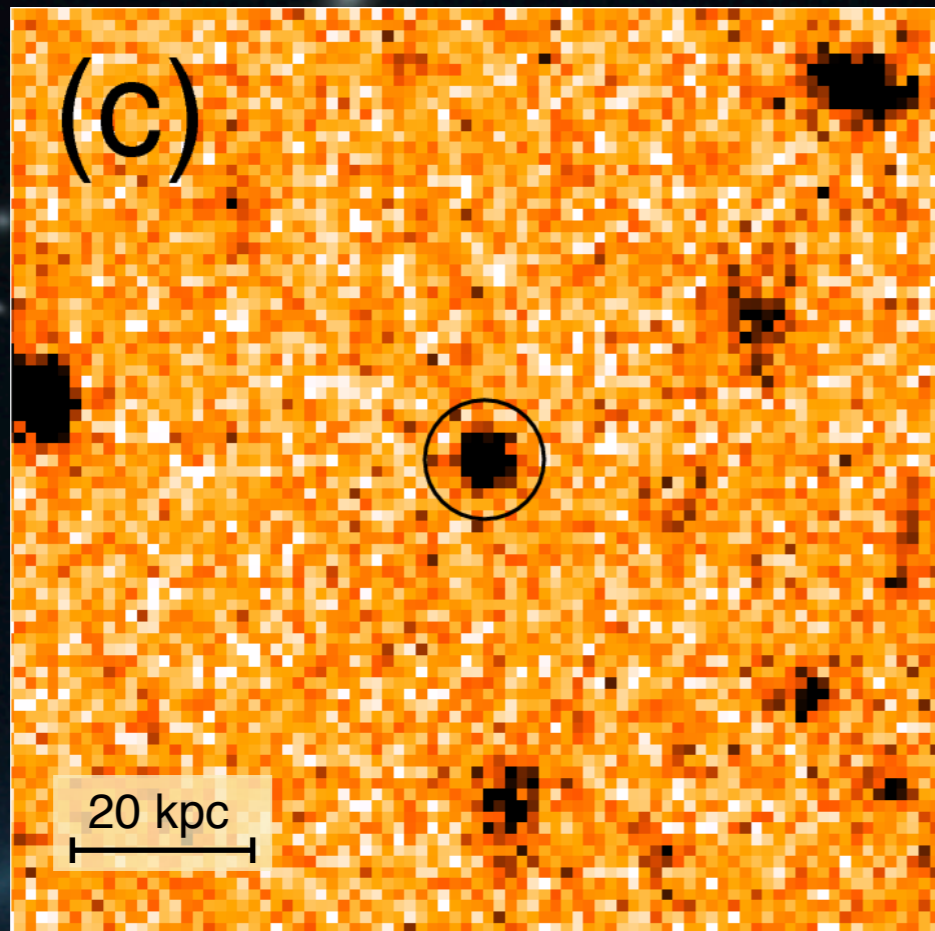


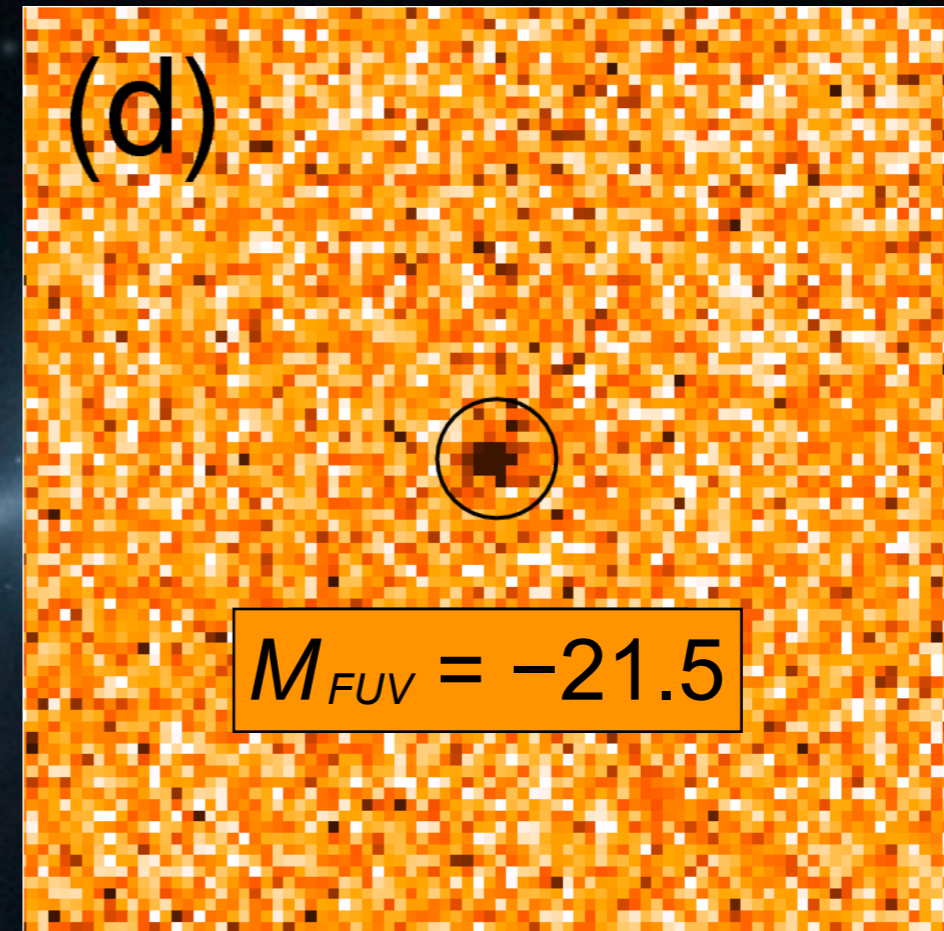
Subaru luminous supernovae at high redshift

Sandra Savaglio (Max-Planck-Institut für extraterrestrische Physik, Garching)

LBG $z=3.899$ (2005/2006)



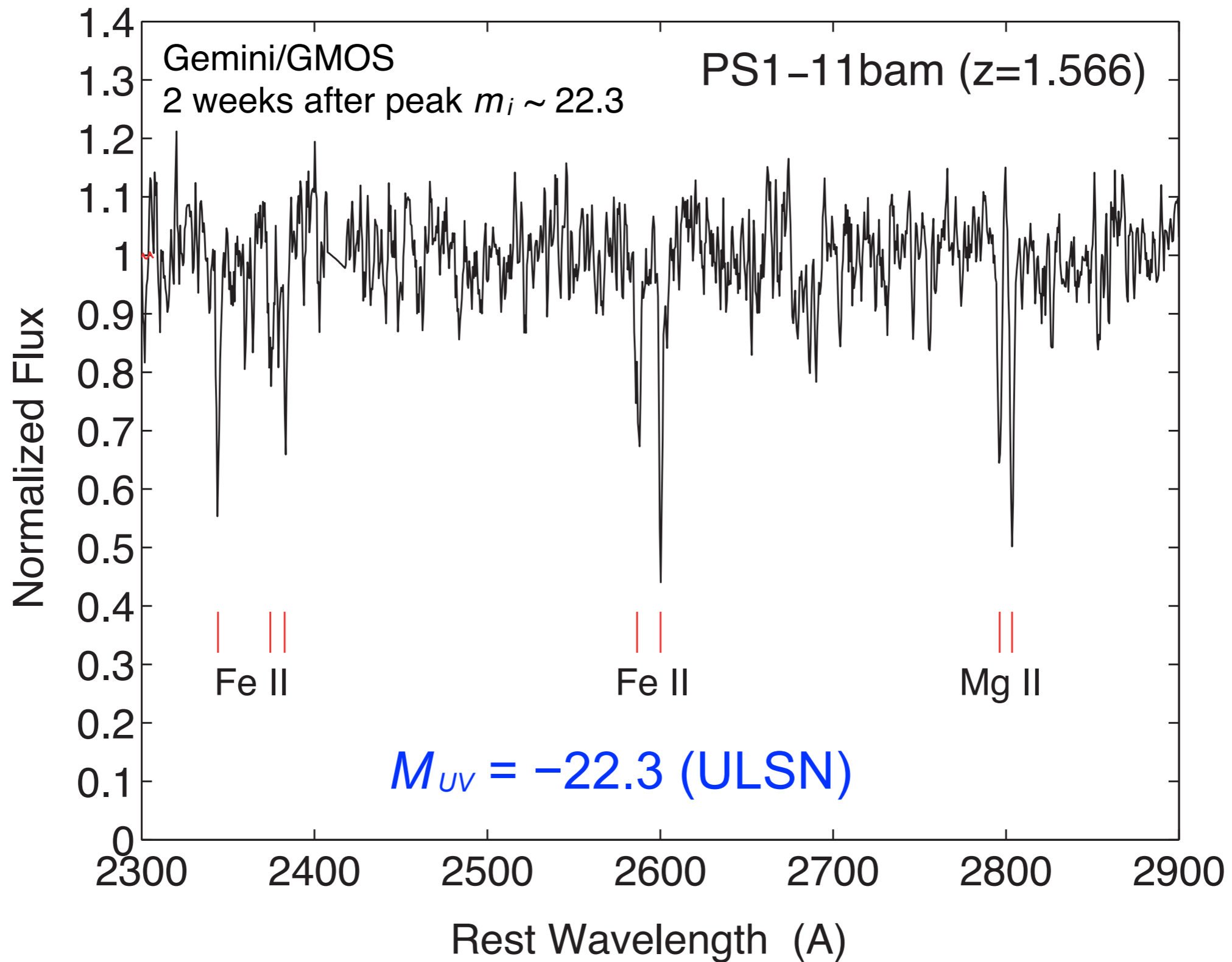
SN 1000+0216 (2007/2008)



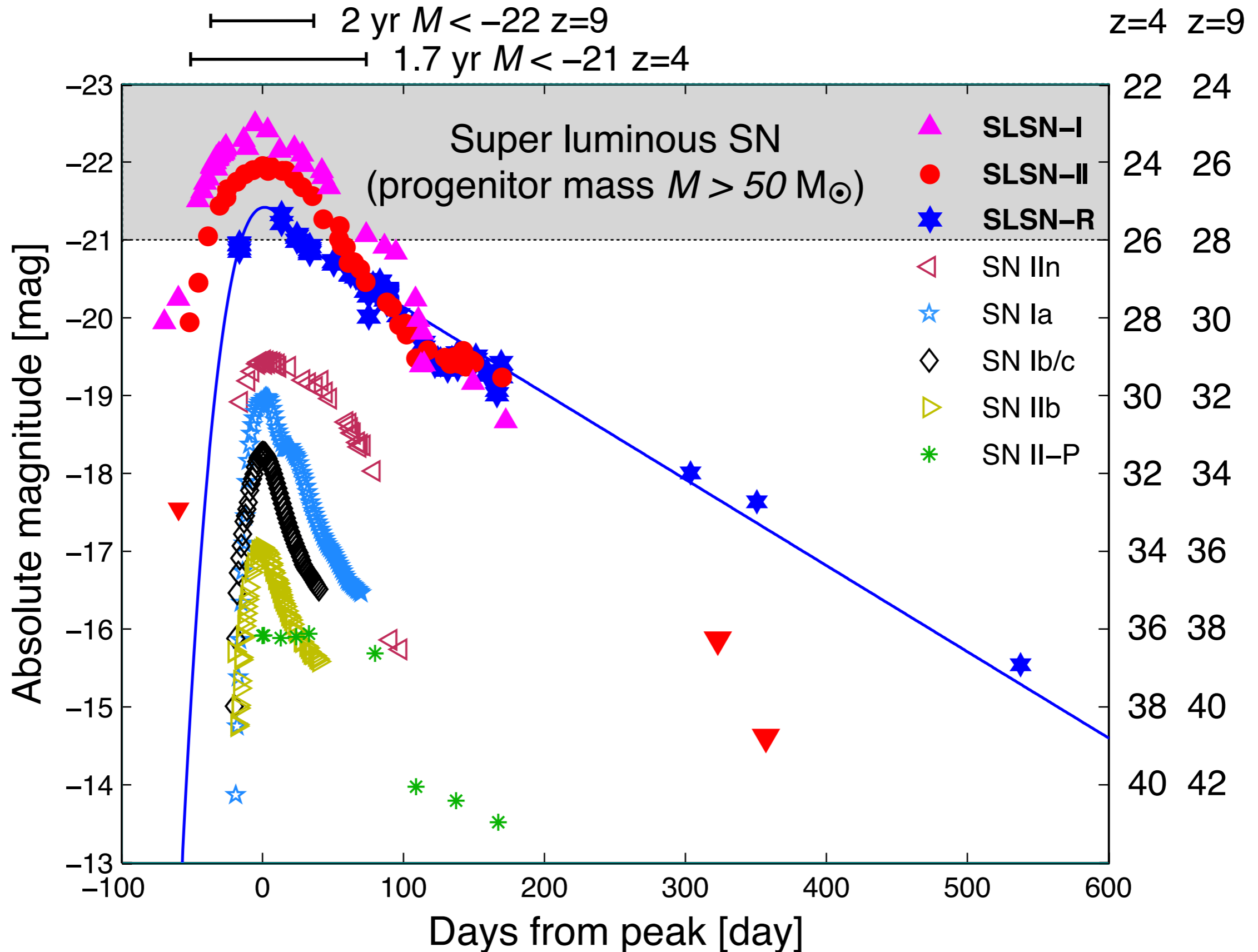
Cooke et al. (Nature, 2012)



HIRES-EELT observations of SLSNe

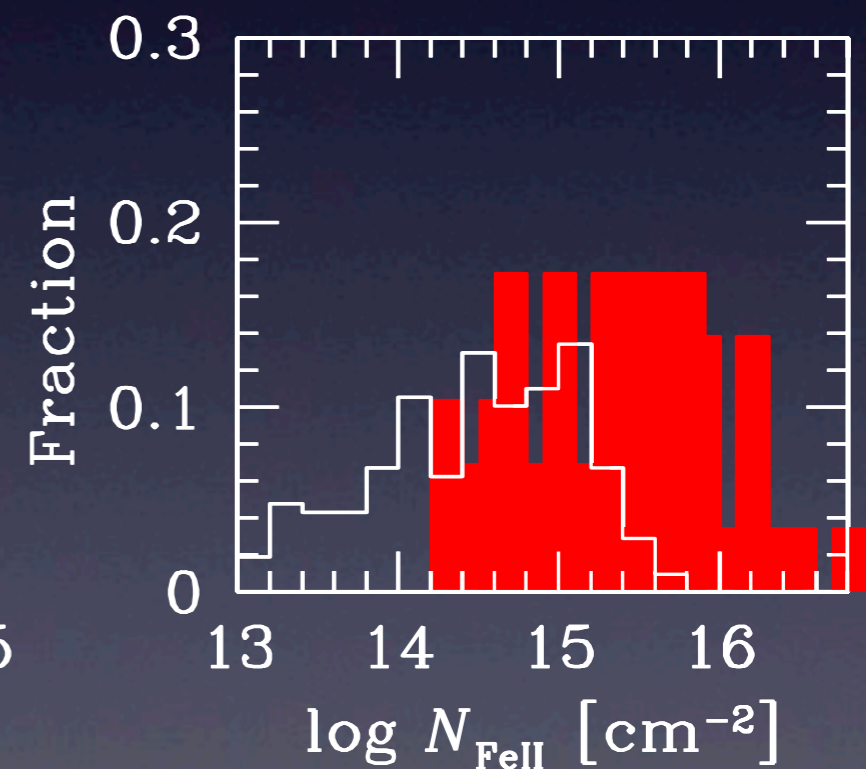
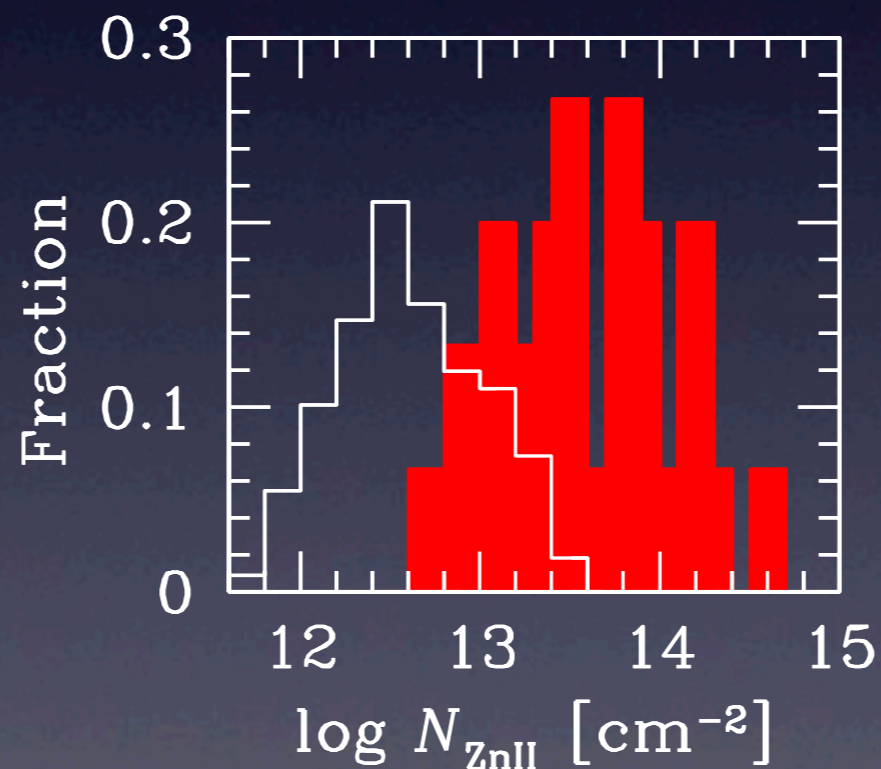
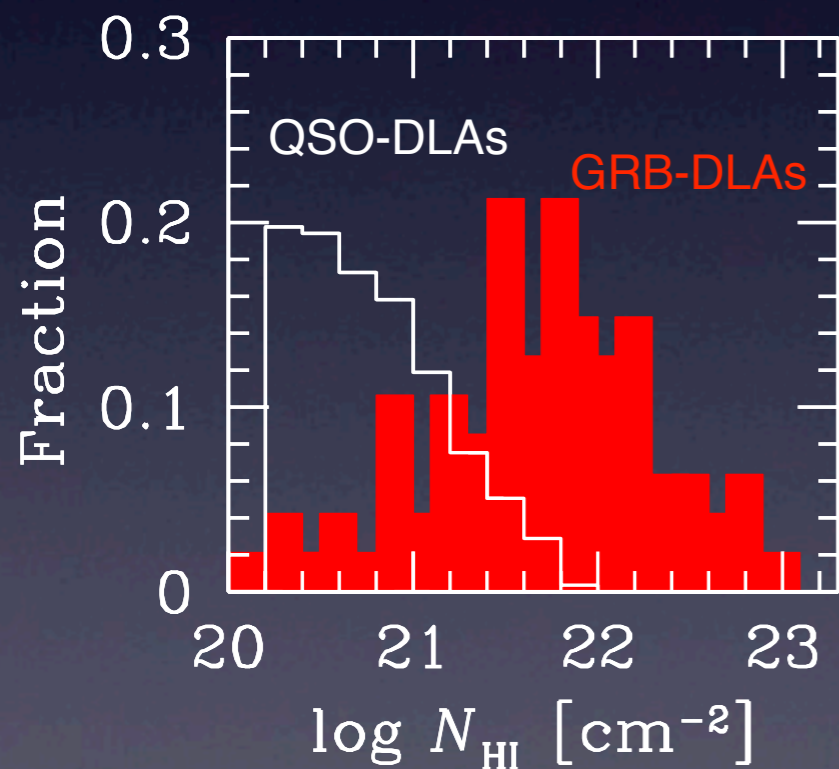


Super luminous SN peak luminosity



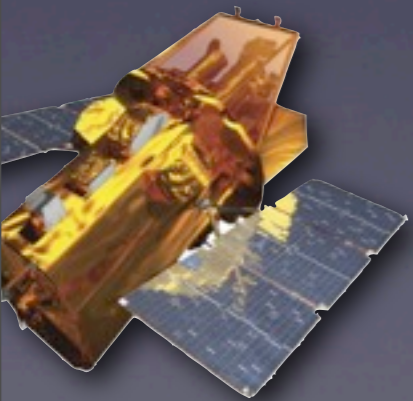
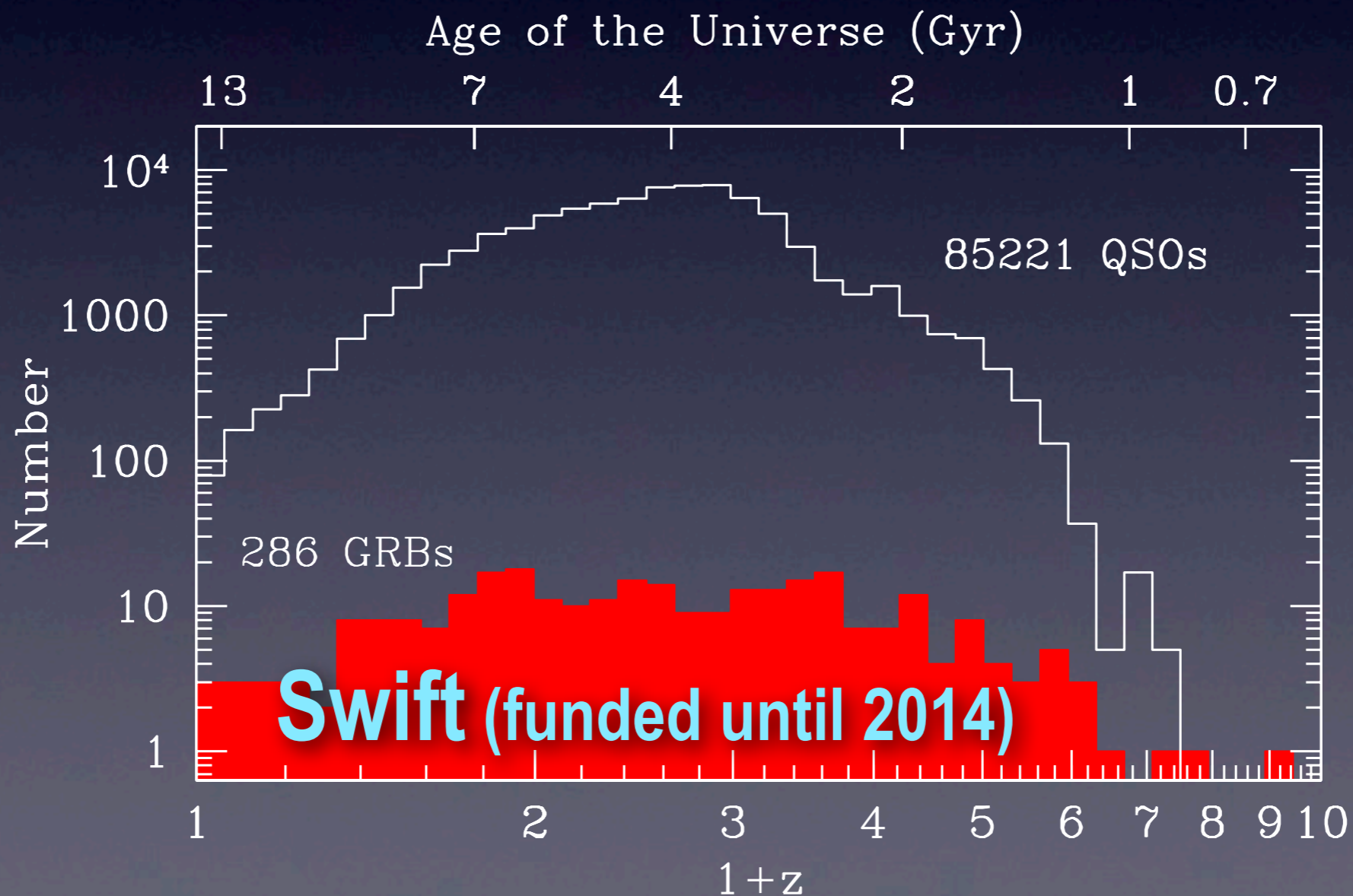
SLSNe to explore the cosmic chemical evolution

- ✓ With medium/high-resolution spectroscopy at E-ELT
- ✓ SLSNe alternative to QSO-DLAs and GRB-DLAs
- ✓ GRB-DLAs show different metal content than QSO-DLAs, but fast
- ✓ SLSNe are rare explosions, but not as difficult as GRBs



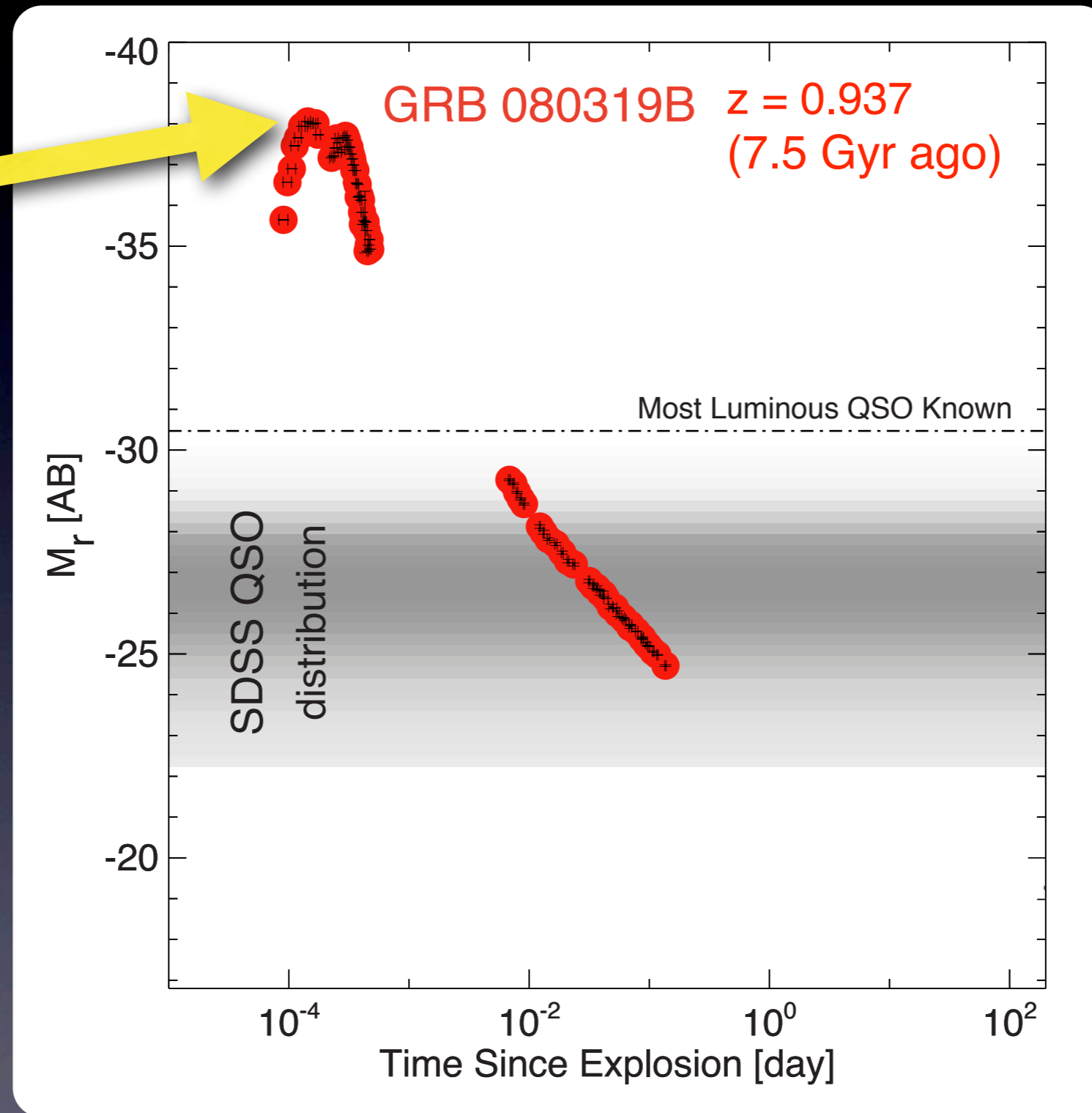
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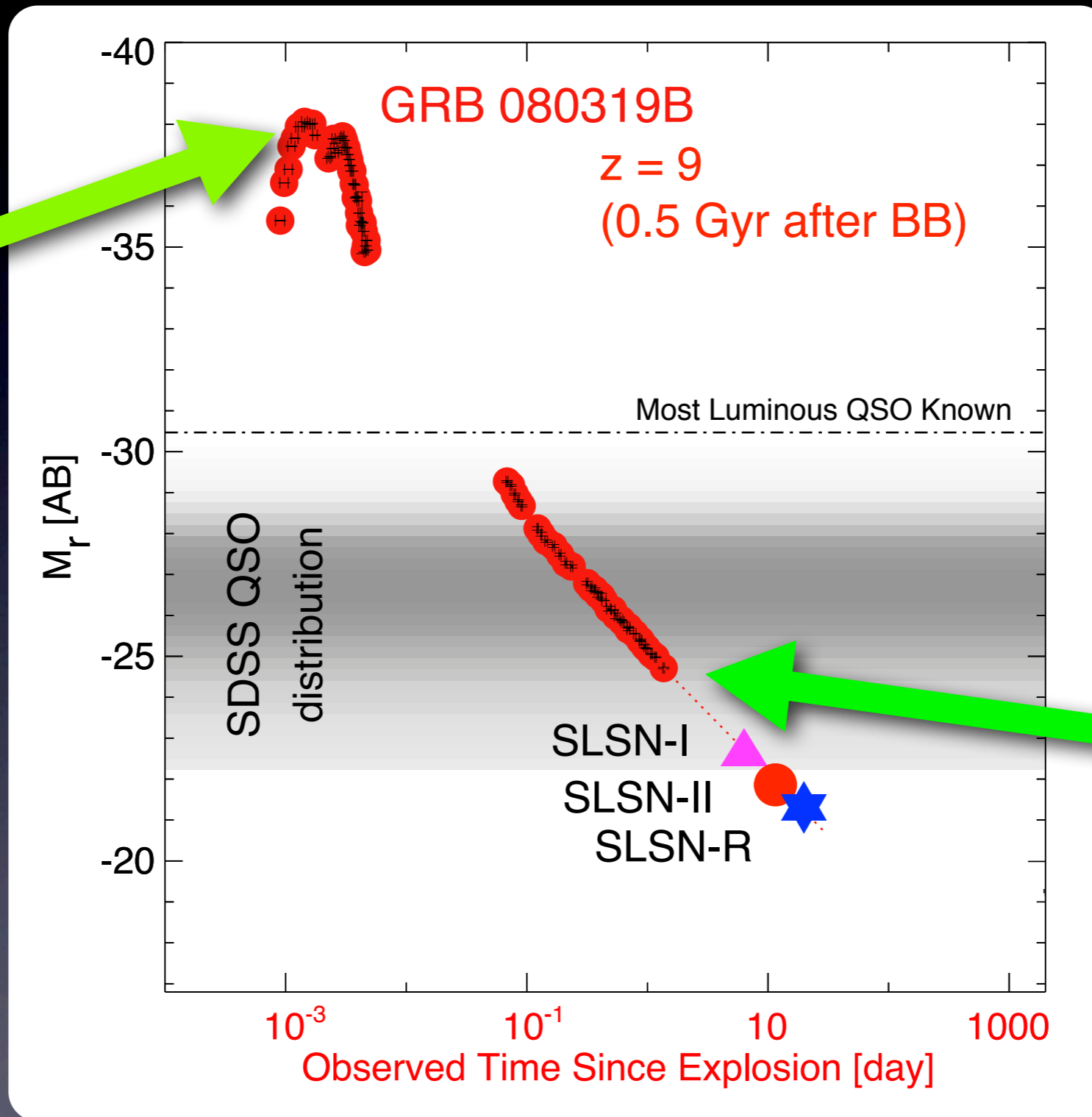
Light curve of brightest GRB

Visual
magnitude
 $m = 5.6$



Light curve of brightest GRB

J-band
 $m_{AB} = 12.0$
 $R = 100,000$



GRB 080319B

$z = 9$

(0.5 Gyr after BB)

Most Luminous QSO Known

M_r [AB]

SDSS QSO
distribution

SLSN-I

SLSN-II

SLSN-R

10^{-3}

10^{-1}

10

1000

Observed Time Since Explosion [day]

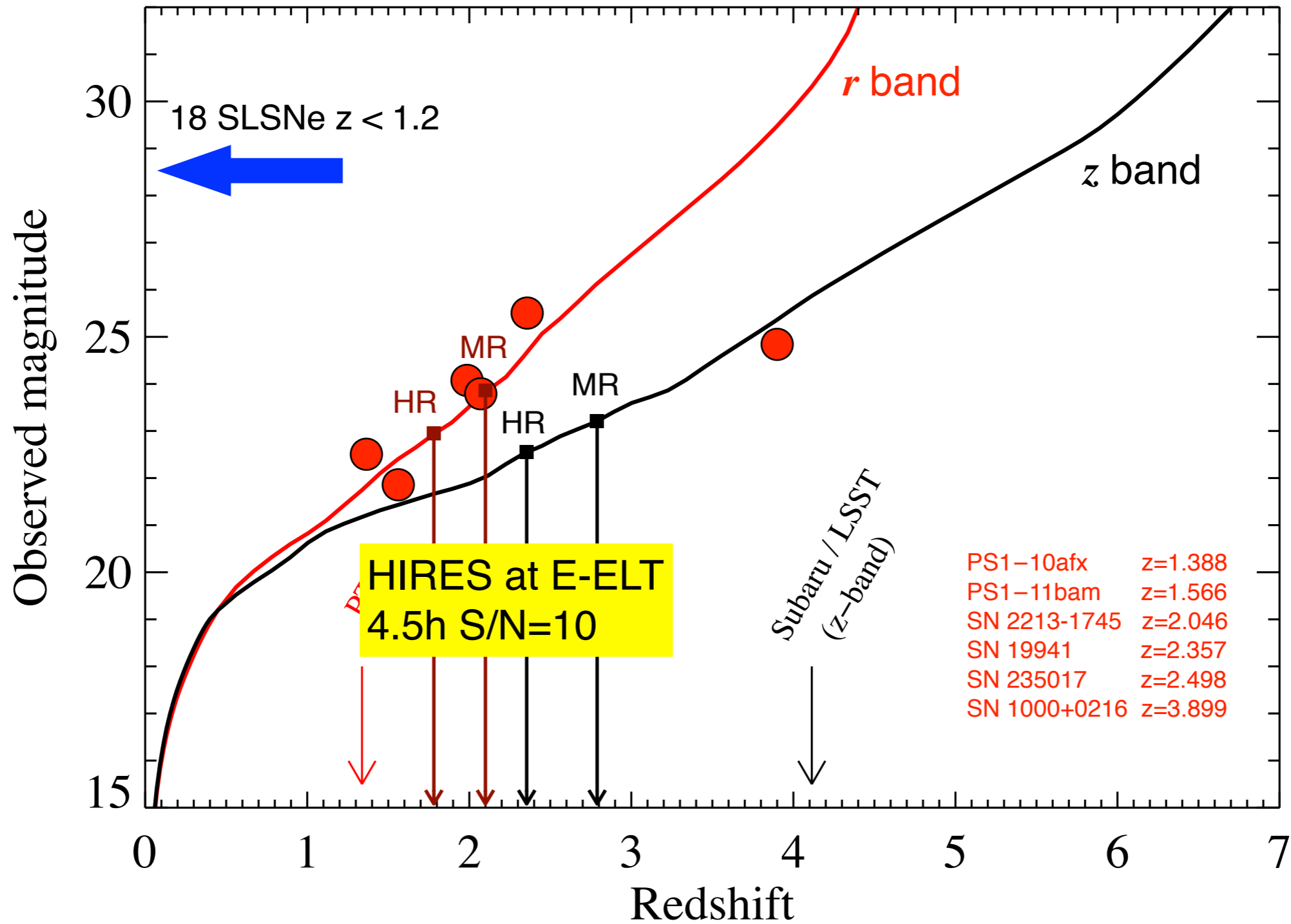
35 hr after

$m_{AB} = 25.5$

$R = 3000$

$S/N = 10$

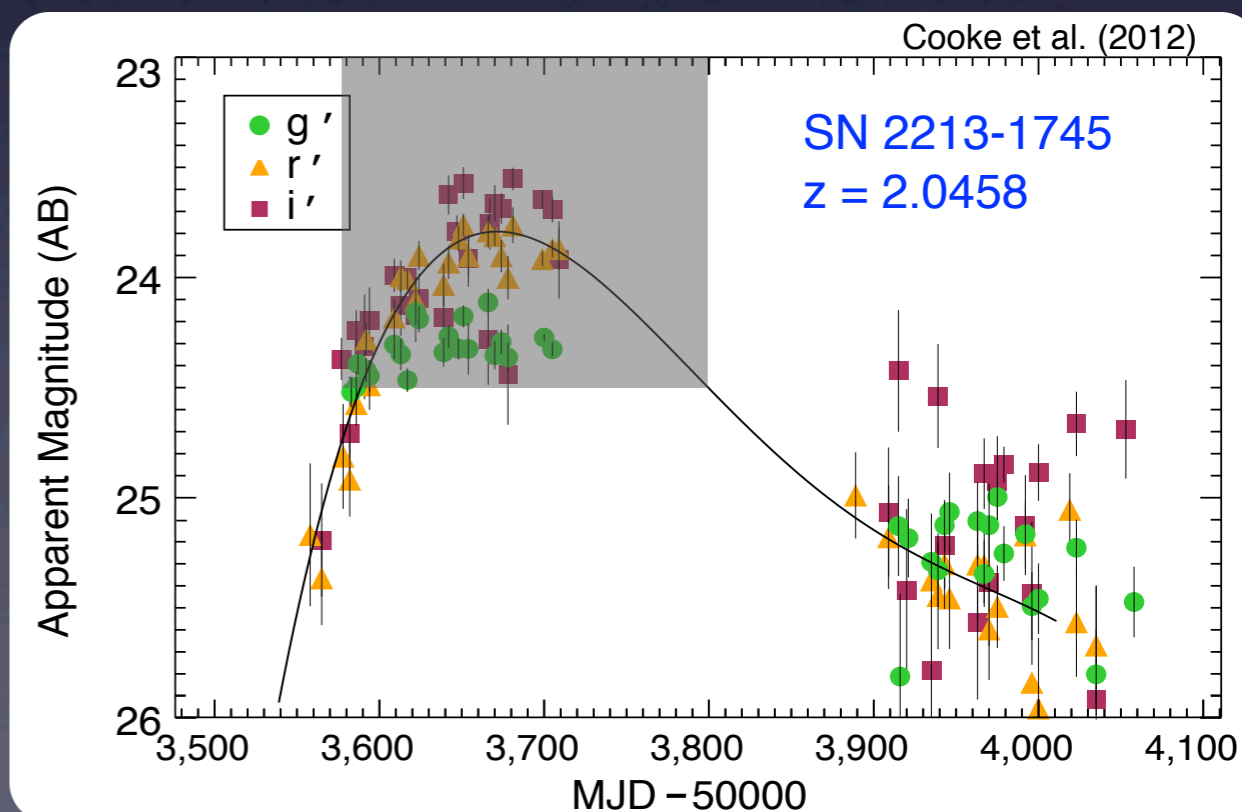
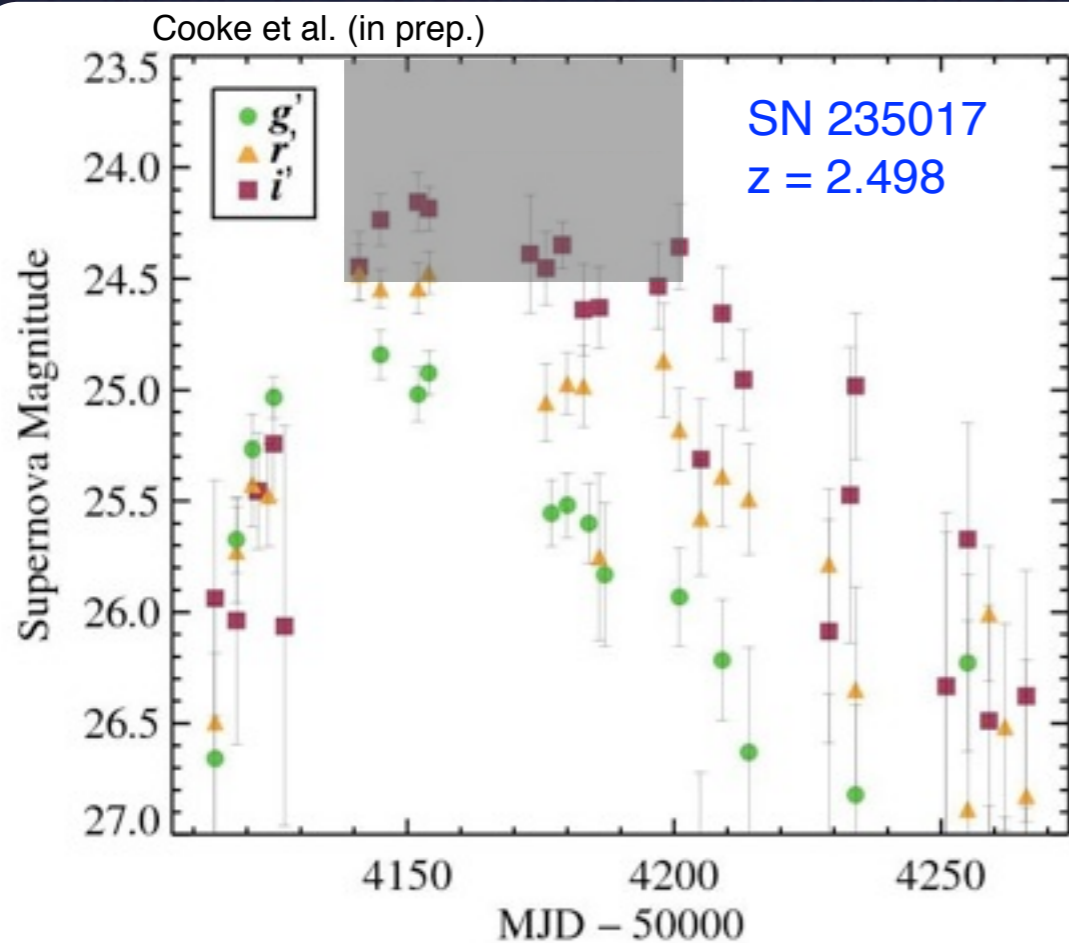
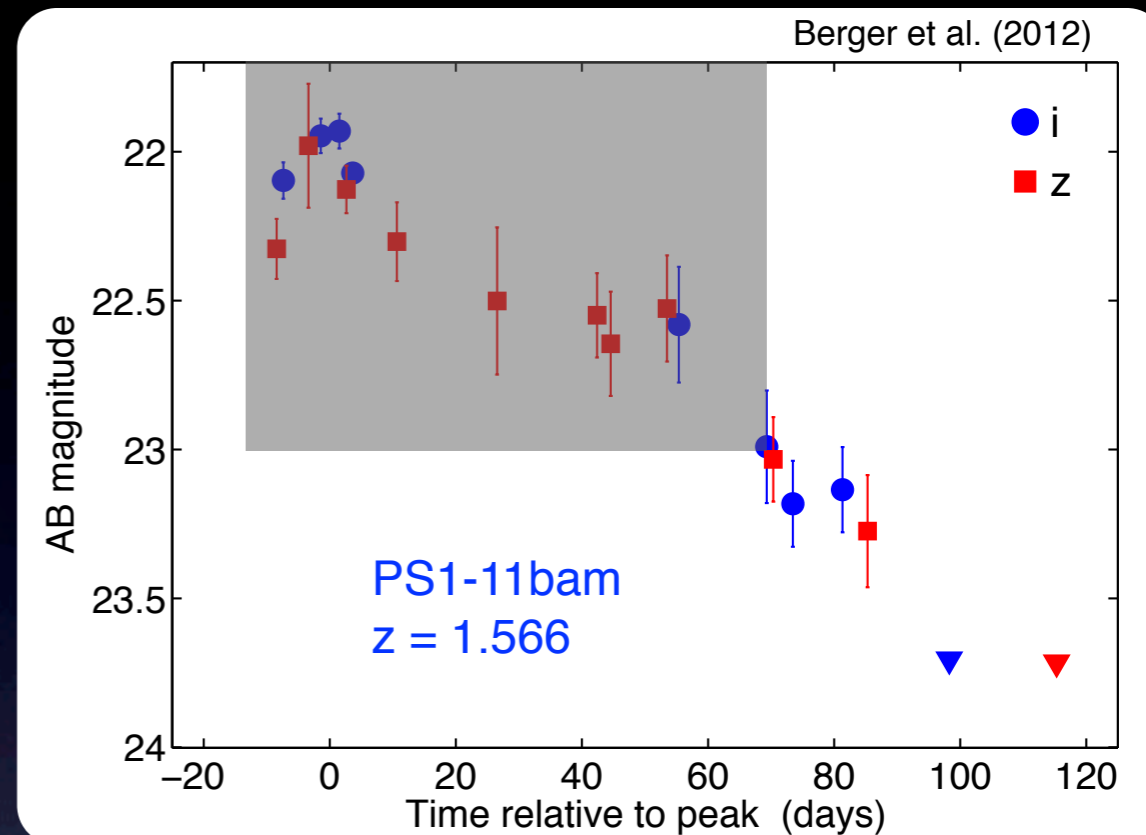
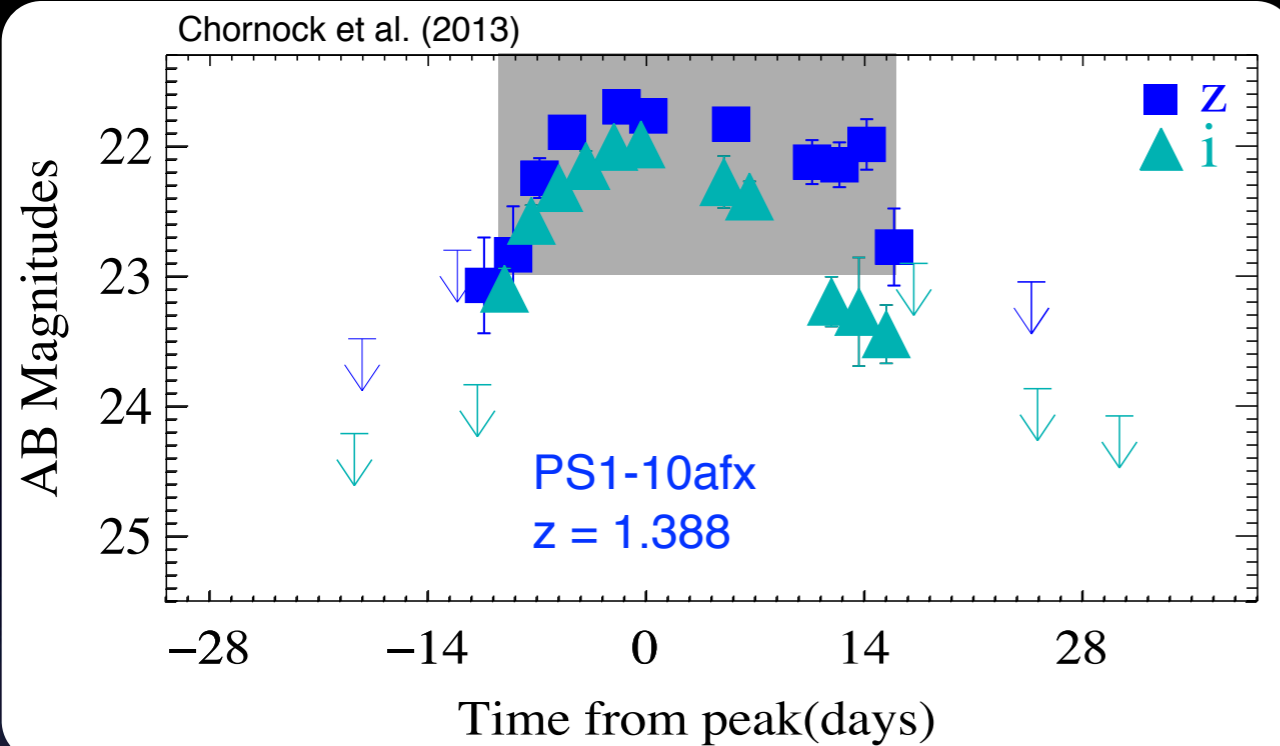
Detectability of super luminous SN



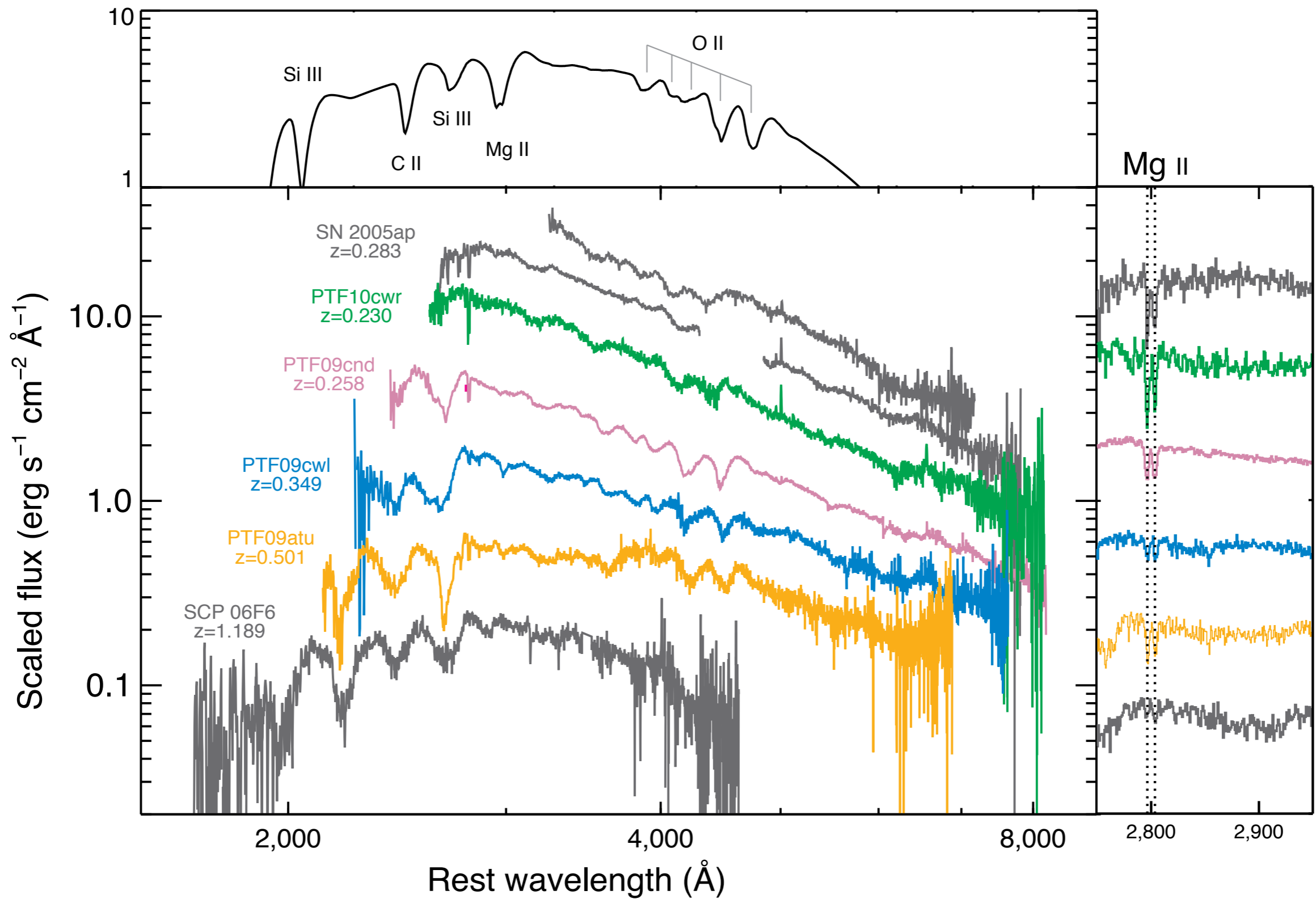
Super luminous SN at low/high redshift

Type	redshift	Rate (Gpc ⁻³ yr ⁻¹)
SLSN-I	0.17	32 ⁺⁷⁷ ₋₂₆
SLSN-II	0.15	151 ⁺¹⁵¹ ₋₈₂
Total (I+II)	0.16	199 ⁺¹³⁷ ₋₈₆
High-z SLSN	2 – 4	~ 400

Slow evolution of light curve

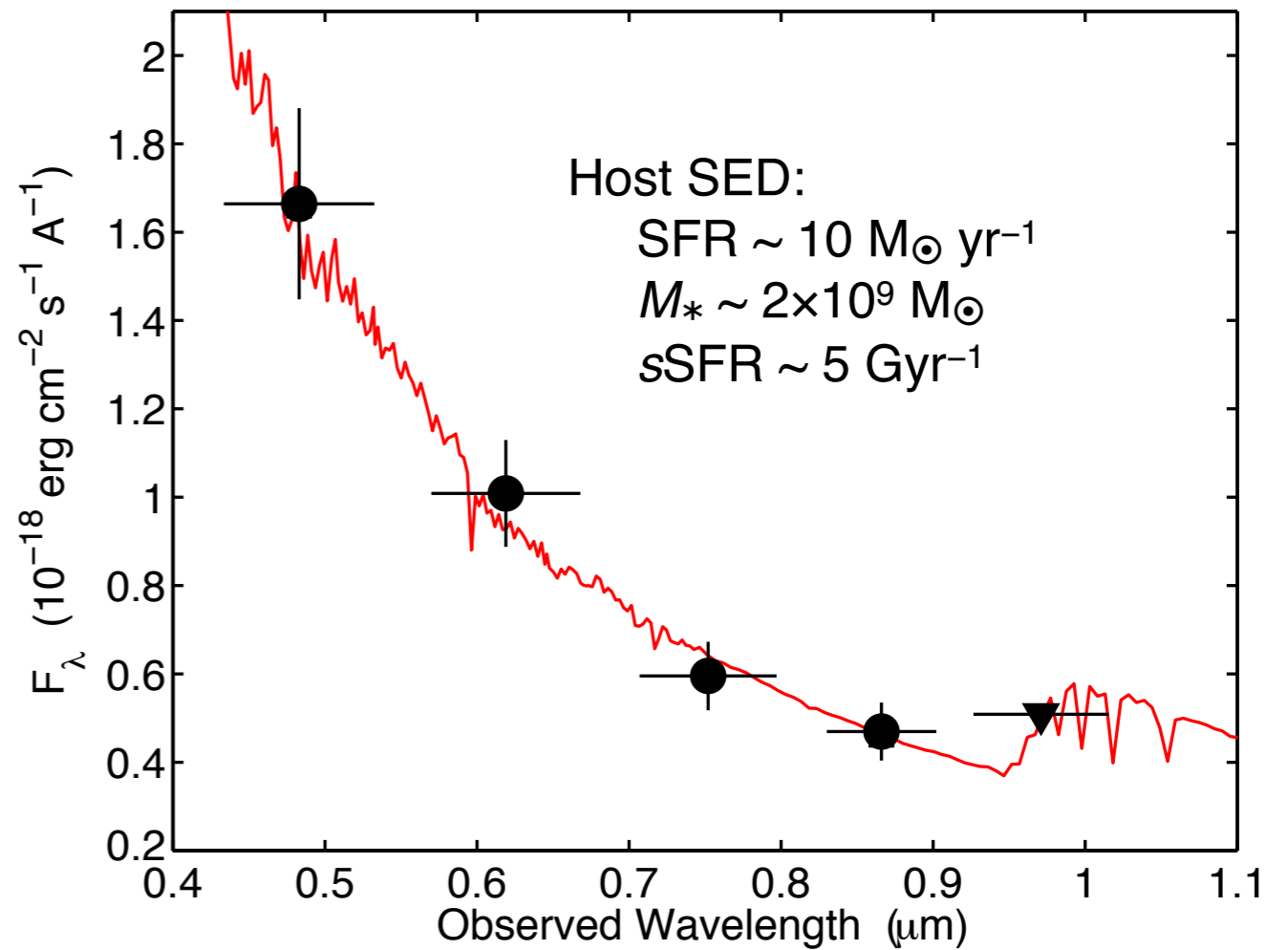
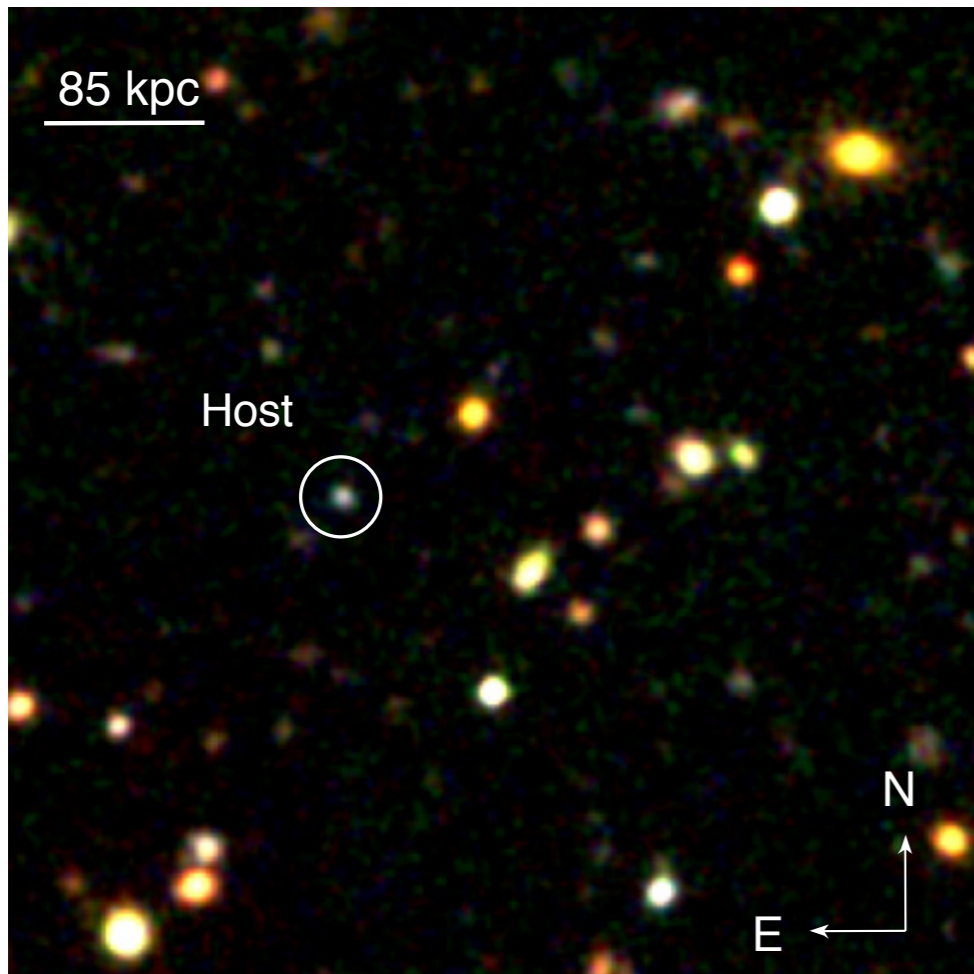


The interstellar medium in SLSN hosts

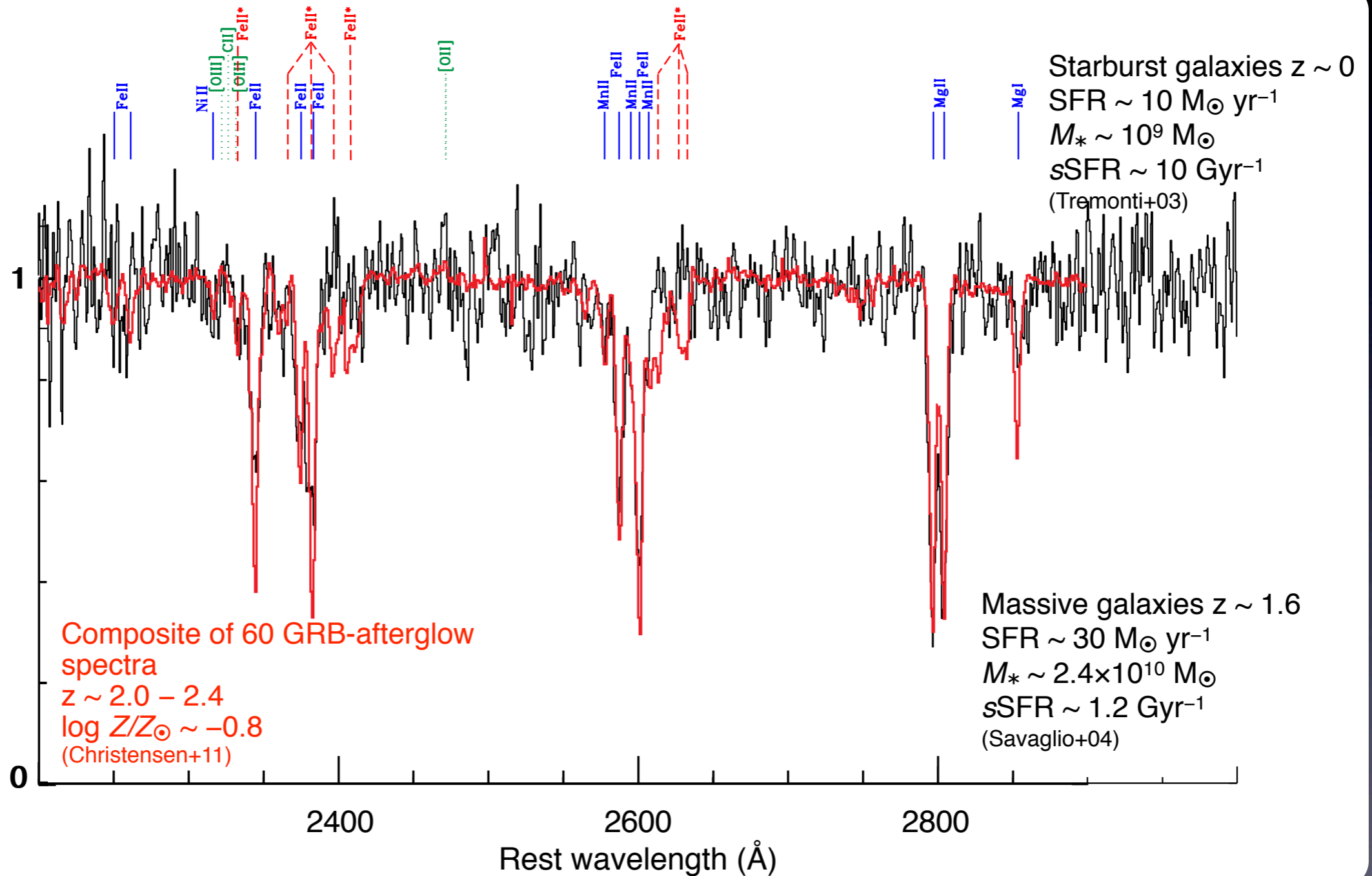


The interstellar medium in SLSN hosts

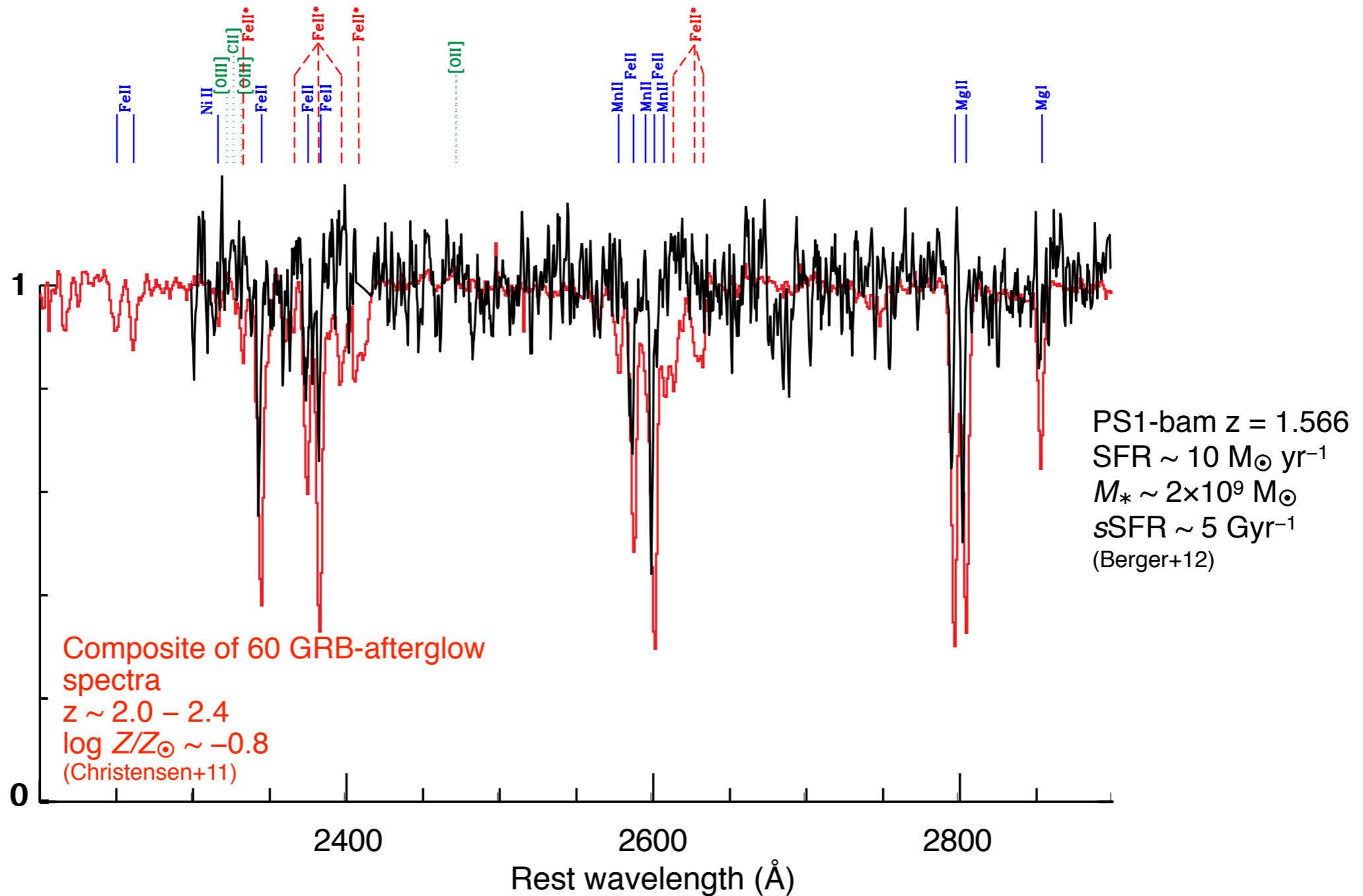
PS1-11bam $z = 1.566$



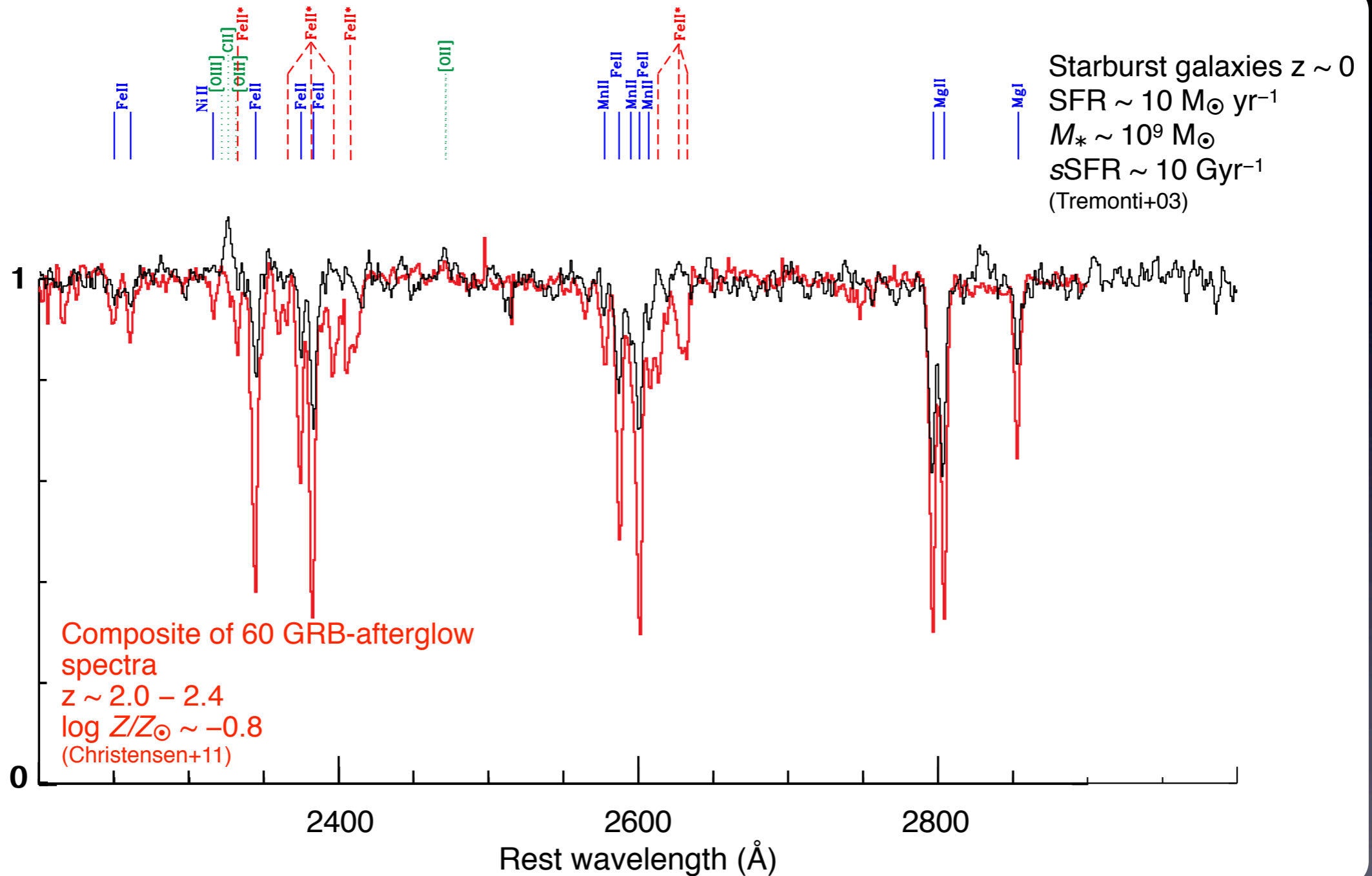
The interstellar medium in SLSN hosts



The interstellar medium in SLSN hosts

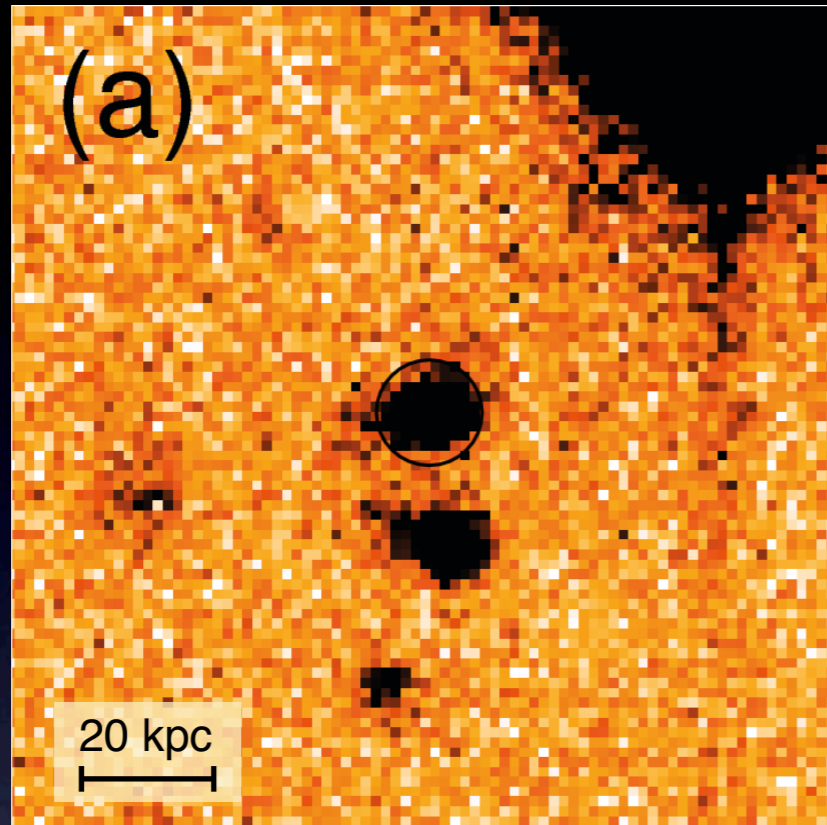


The interstellar medium in SLSN hosts

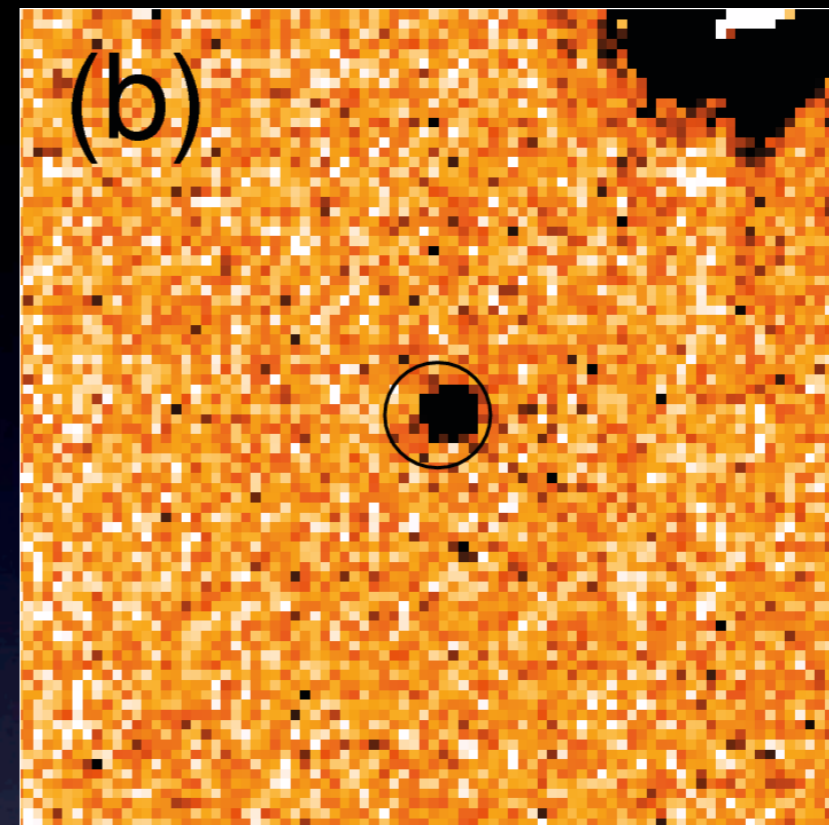


Interacting LBGs, site of high-z SLSNe?

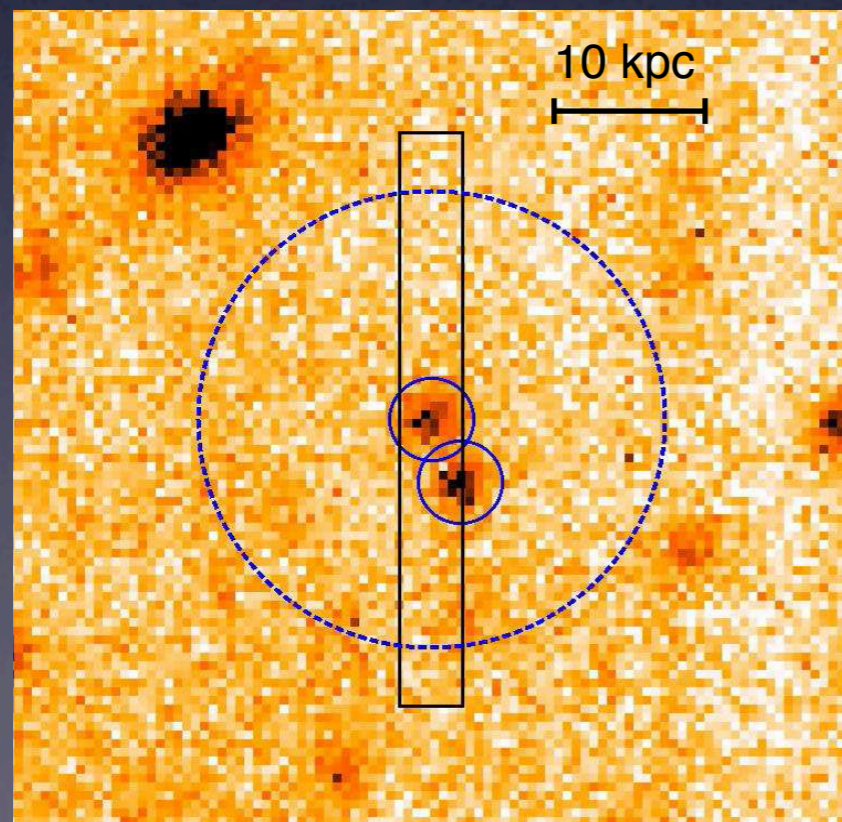
LBG $z=2.0458$



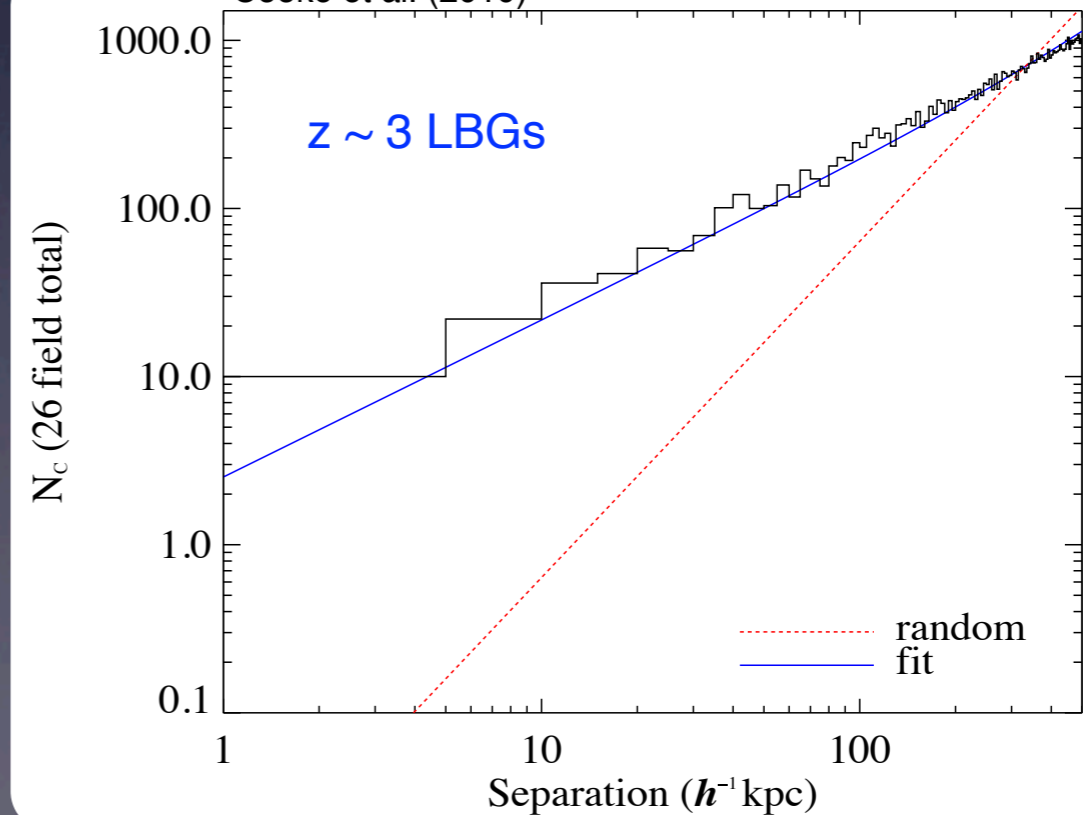
SN2213- 1745 (Cooke et al. 2012)



Berrier & Cooke (2012)

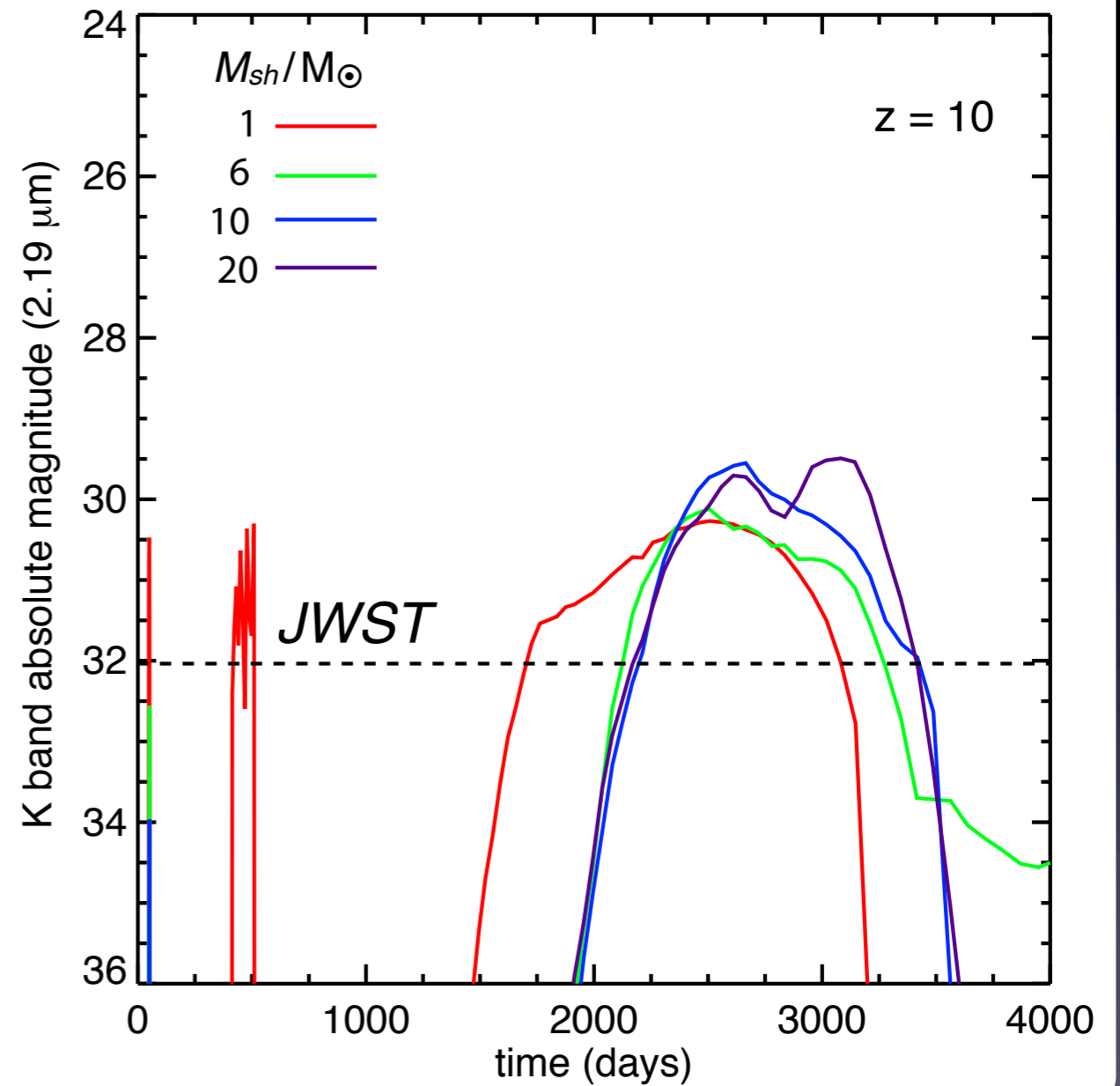
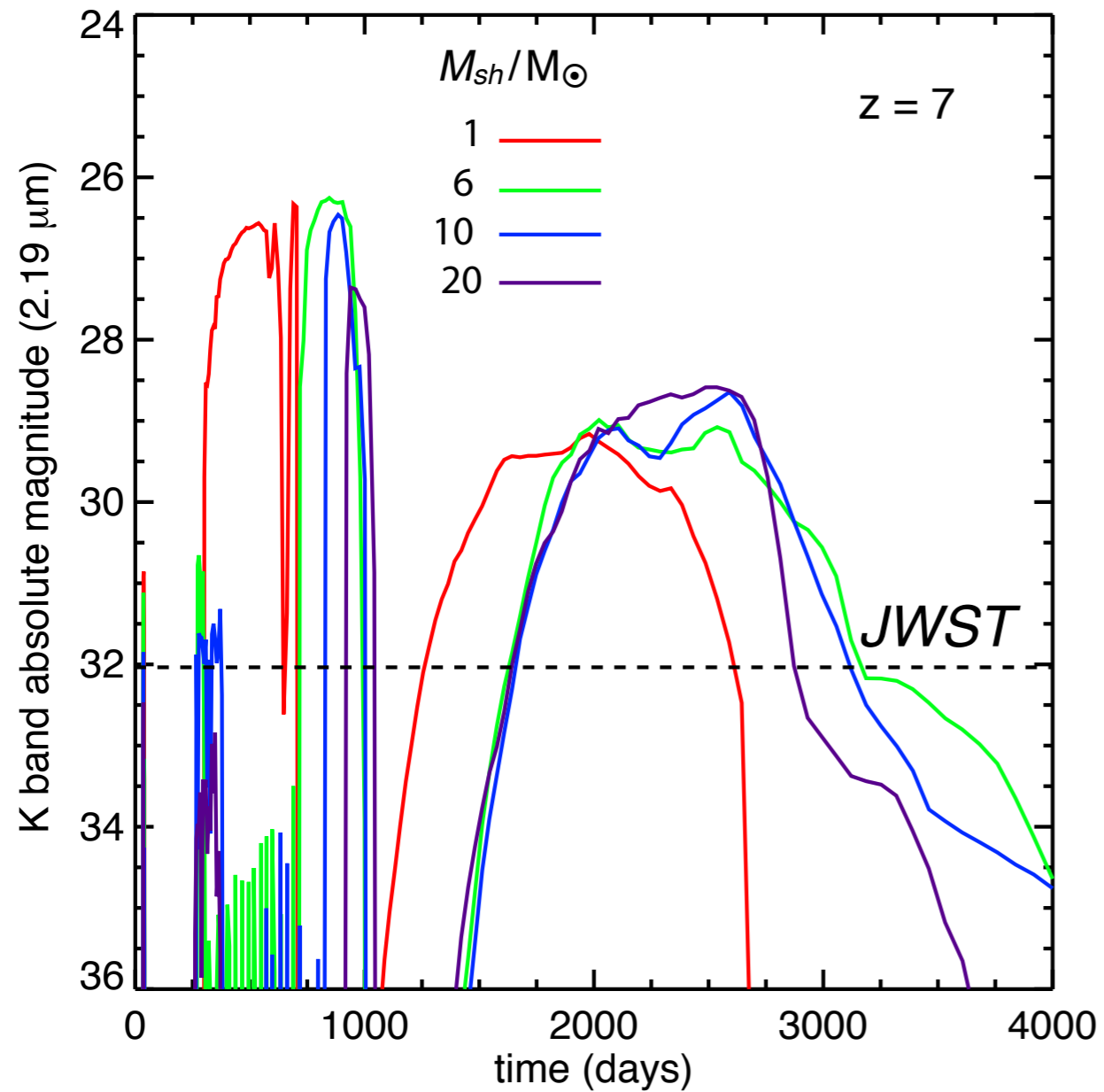


Cooke et al. (2010)



PopIII SNe at very high redshift

More common, but not very massive (progenitor $M < 100 M_{\odot}$)



Conclusions / Future

- ① SLSNe have very massive progenitor ($M = 50 - 250 M_{\odot}$)
- ② SLSNe rare, but perhaps more common at high z than today
- ③ Most distant supernova discovered to date at $z=3.9$
- ④ Slow evolution of UV luminosity, many months at high z
- ⑤ Where to look: LBGs in the process of merging ?