

Superluminous Supernovae at High-z with WFIRST

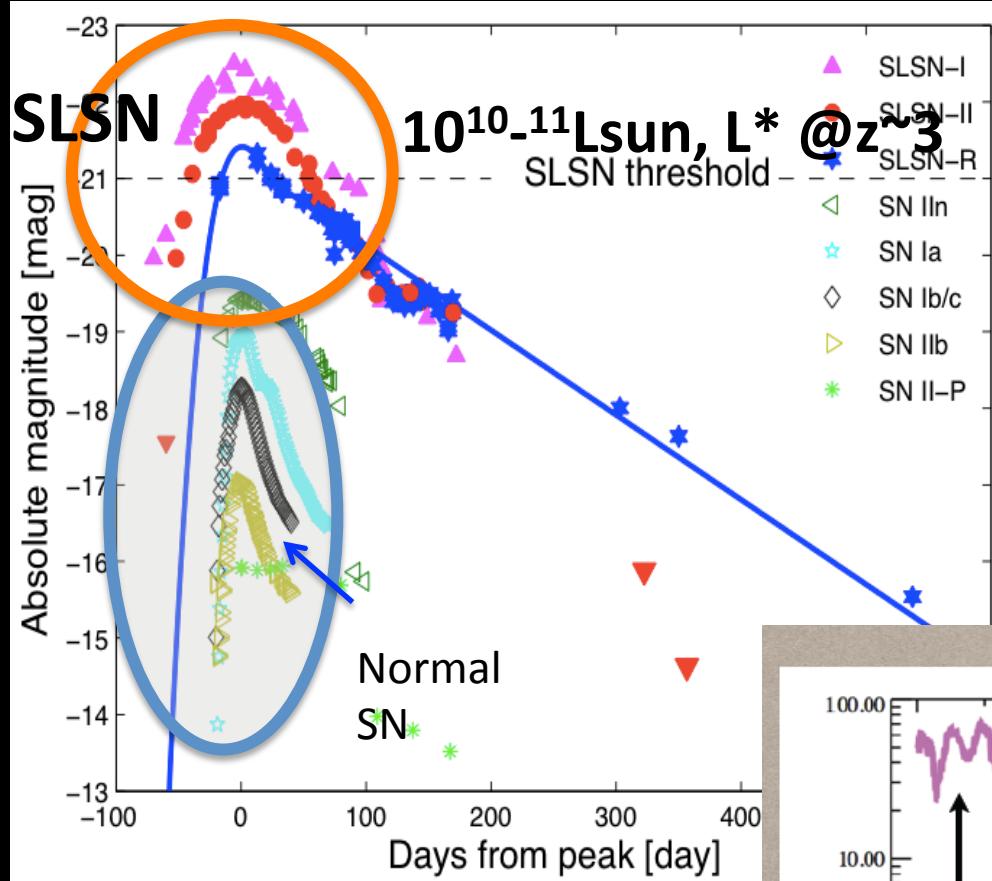
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Project scientist for Intermediate Palomar Transient
Factory

Collaborators: Quimby(SDSU), Gal-yam (Weizmann), de Cia(ESO),
Perley(Denmark),Leloudas(Weizmann),Vreesijk(Weizmann),Lunnan(Caltech)

This talk

- What do we know about low-z SLSNe?
- How can this help us to plan for WFIRST observations?
 - diversity of light curves, spectra and hosts
 - Serve as template library (LC and SED)
 - Start planning: observation, data reduction, SLSN identification, follow-up

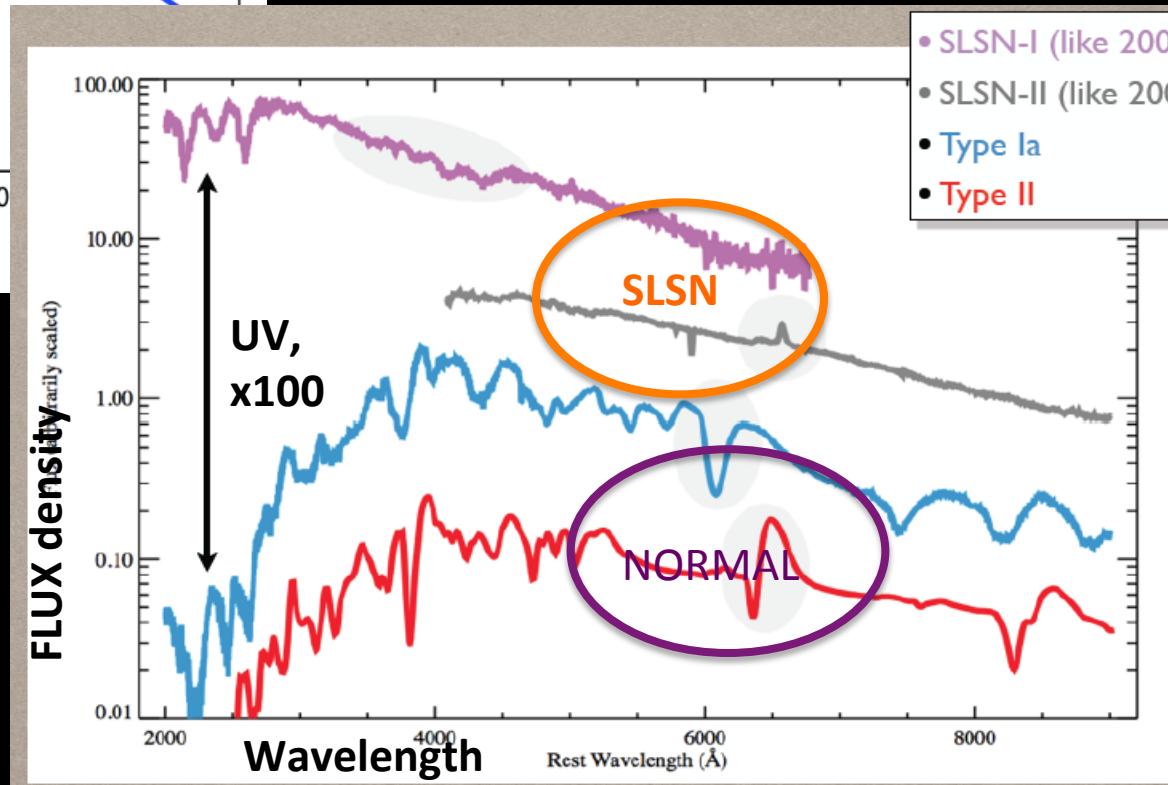


What is a SLSN:

10x brighter, 5x longer, UV bright

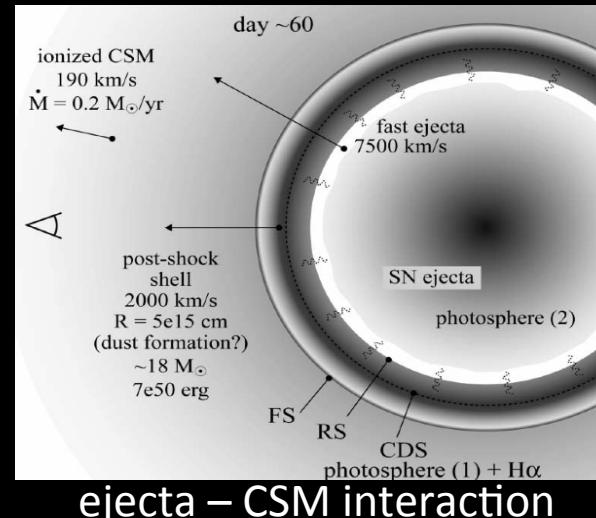
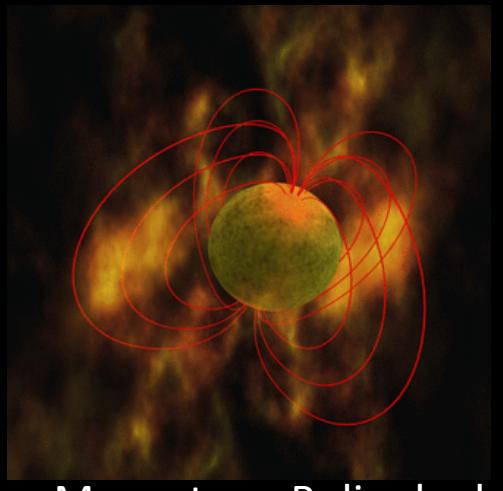
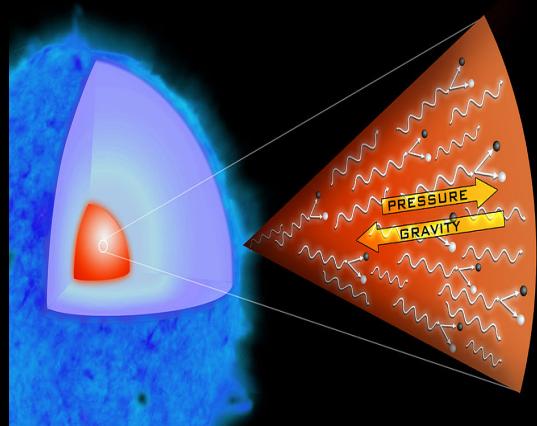
Gal-yam et al. 2012,
Quimby et al. 2011

Credit: Quimby



Interesting explosion physics

- Likely massive progenitors in low-z environment.
- e+e- pair instability ($>130M_{\odot}$)
- Fast spin, high magnetic field NS (magnetar)
- Interaction with dense CSM

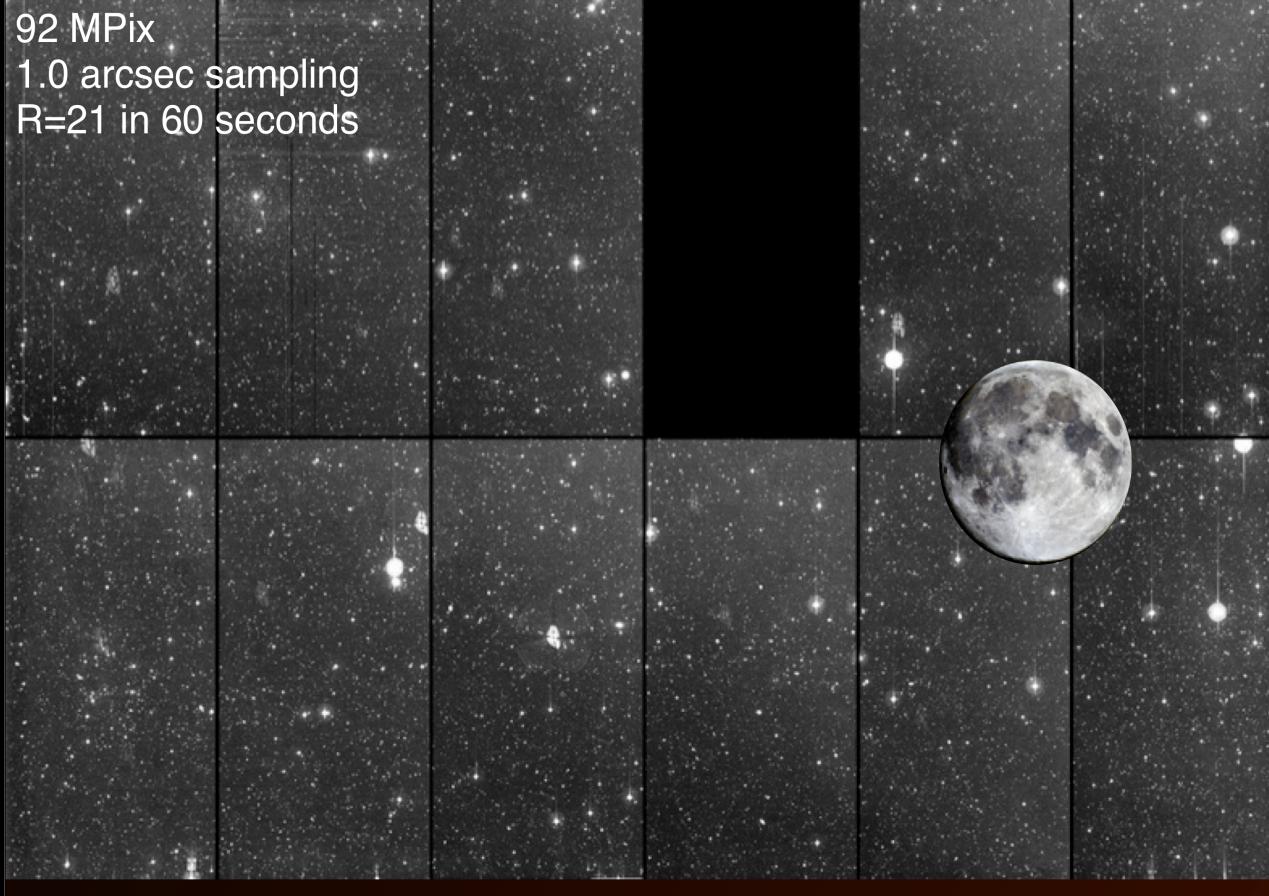


Palomar Transient Factory – an efficient machine for discovering low-z SLSNe

The PTF camera field of view

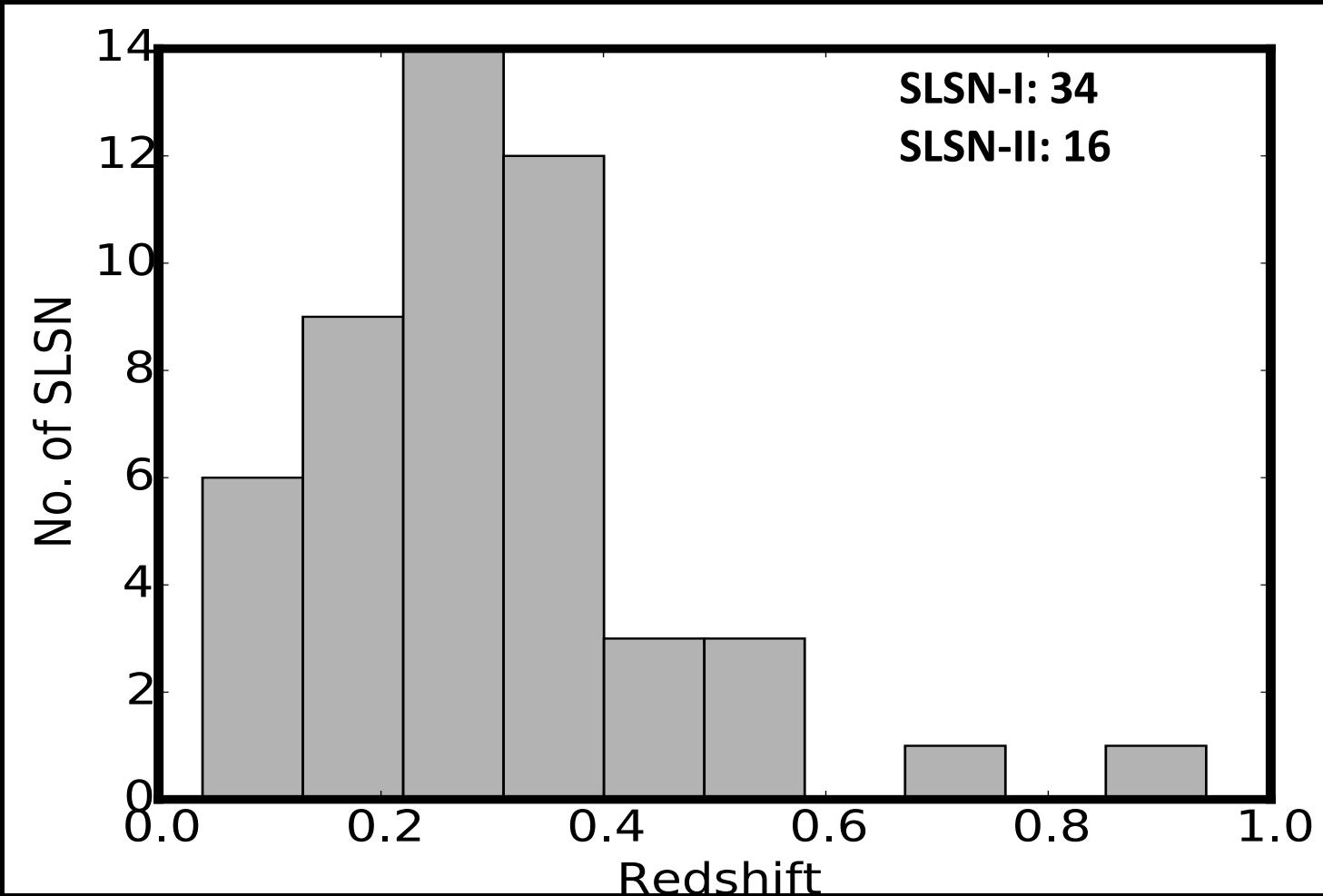
92 MPix

1.0 arcsec sampling
R=21 in 60 seconds

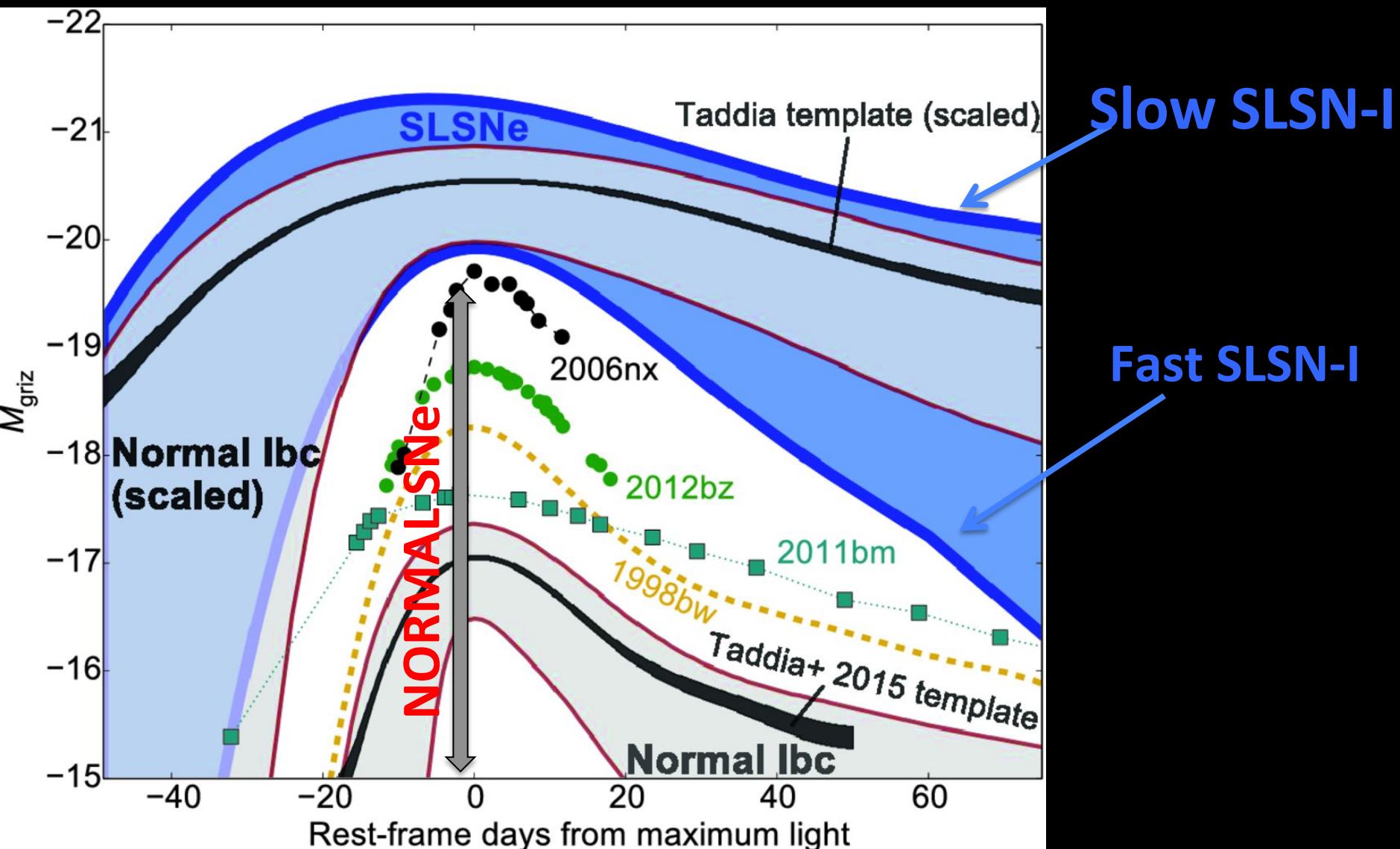


Fov: 7 sq. deg
Palomar 48",
operating since
2009.

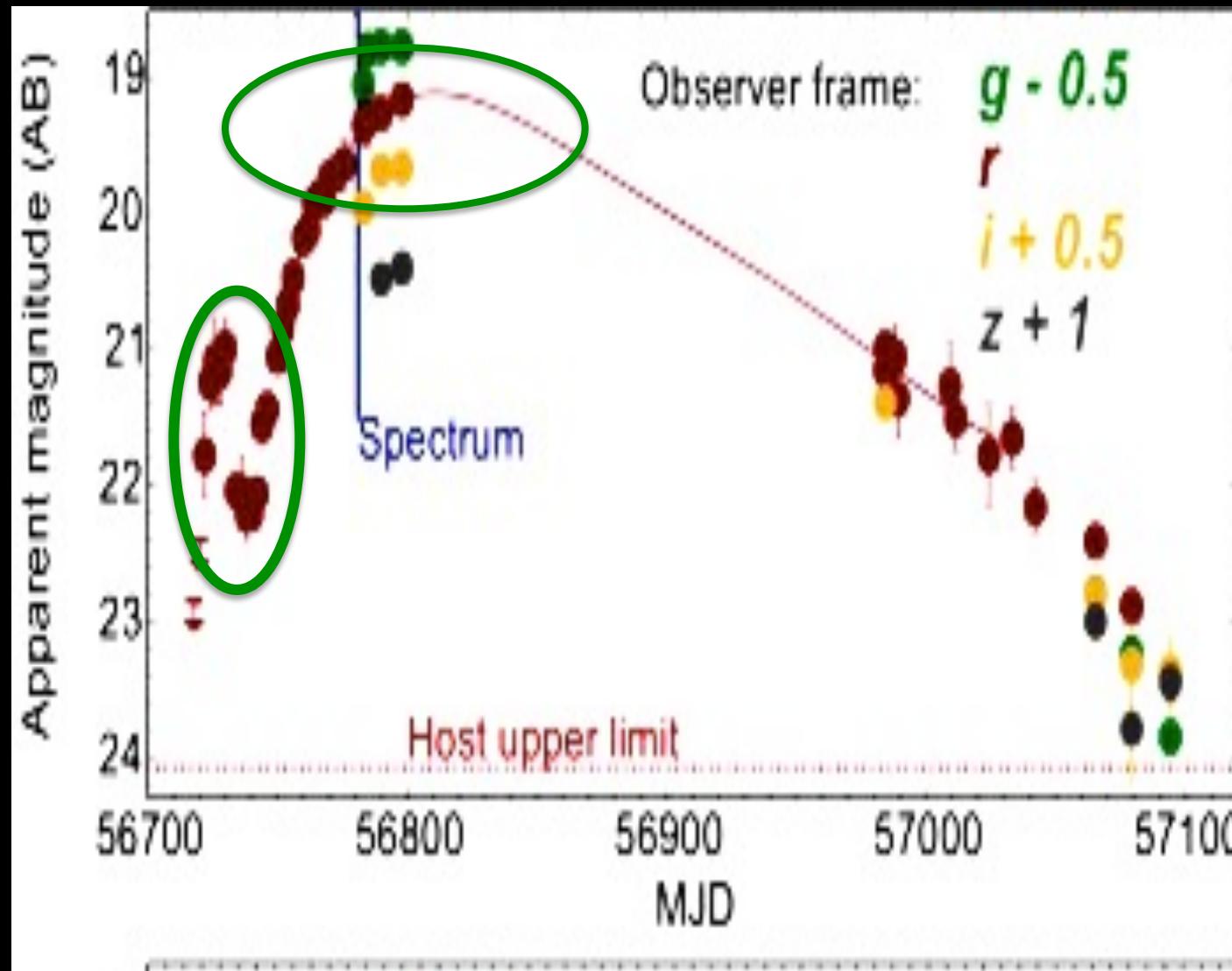
At $z \sim 0.2$, SLSNe are very rare, $200/\text{Gpc}^3/\text{yr}$,
 $\sim 0.3\%$ SNIa (i)PTF has found ~ 50 SLSNe, the
largest sample



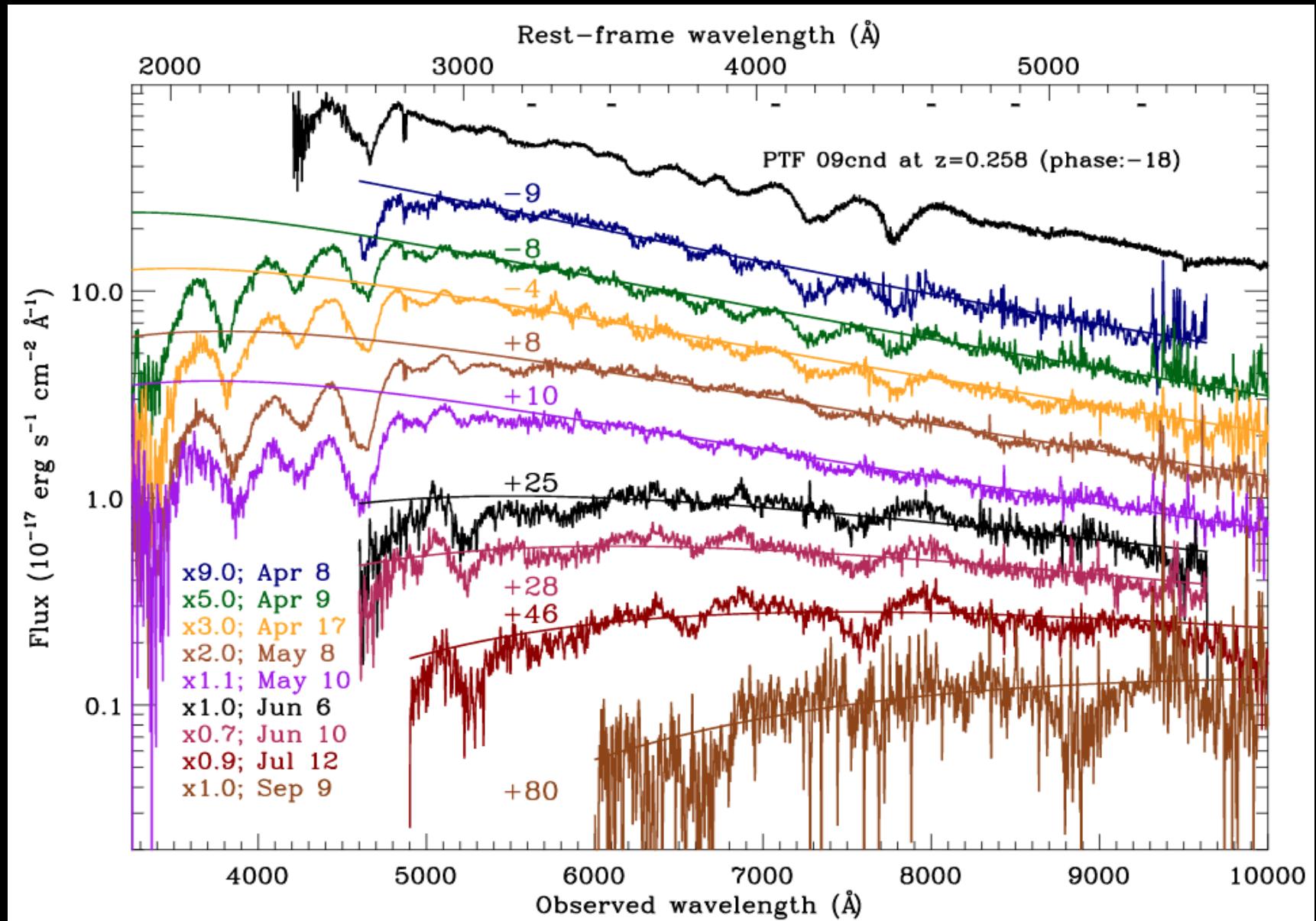
Diversities of SLSN Light Curves



Double-peaked LC



Building SLSN spectral Library, SED (t, source)

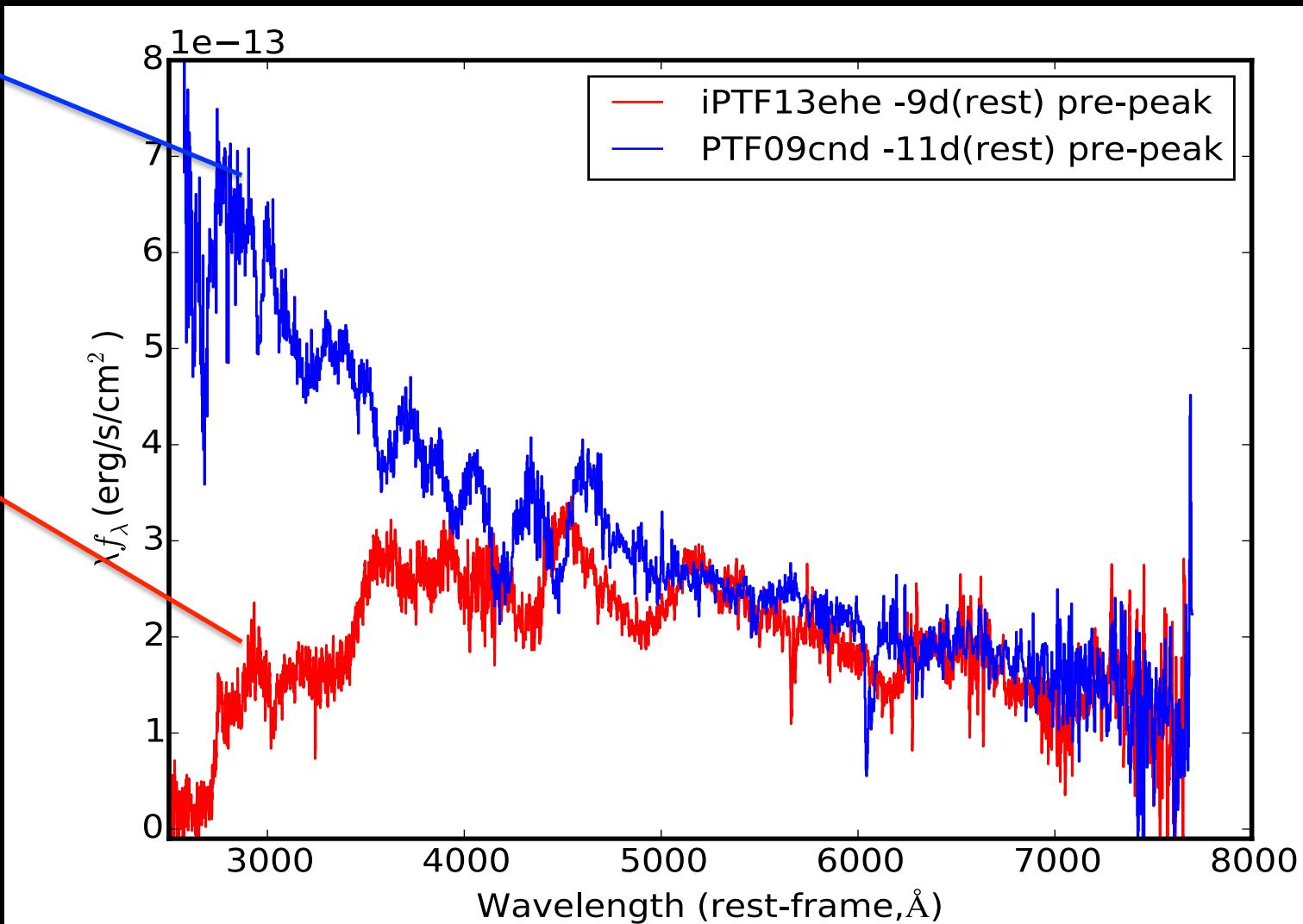


Variations of SLSN spectra

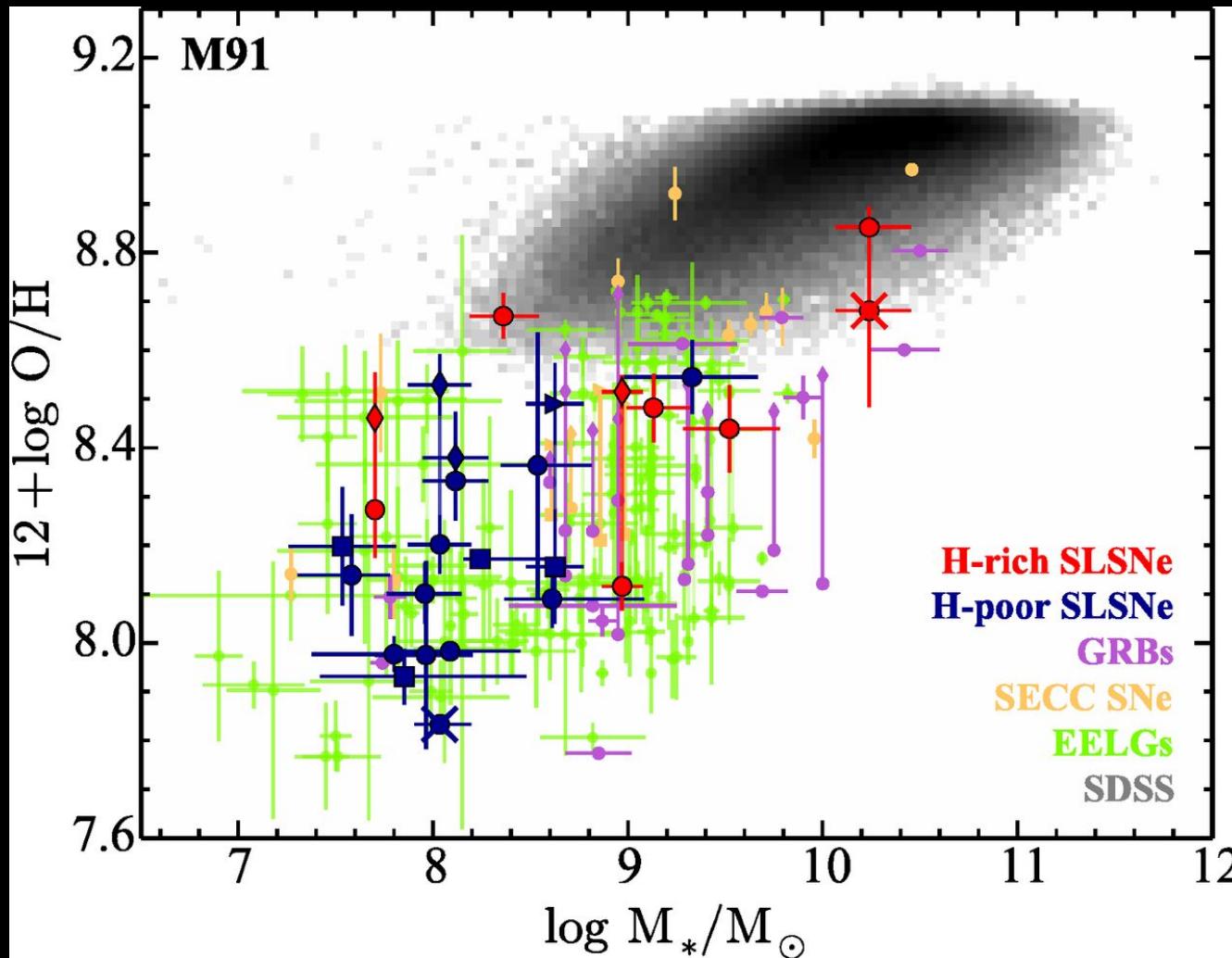
Typical,
SLSN-I



Slow evolving,
SLSN-I, PISN?



Diversity of host galaxies: SLSN-I hosts are mostly dwarfs



Future work

- Identification --- Light curve – very slow evolution because of time dilation
- Need to coadd images – in what cadence? Special processing software
- Spectra --- will be difficult from ground. JWST or WFIRST grism follow-up (GO program)
- $Z > 5$ SLSN host galaxies --- low-mass relative to MF at $z > 5$? Might not be true. Unknown.