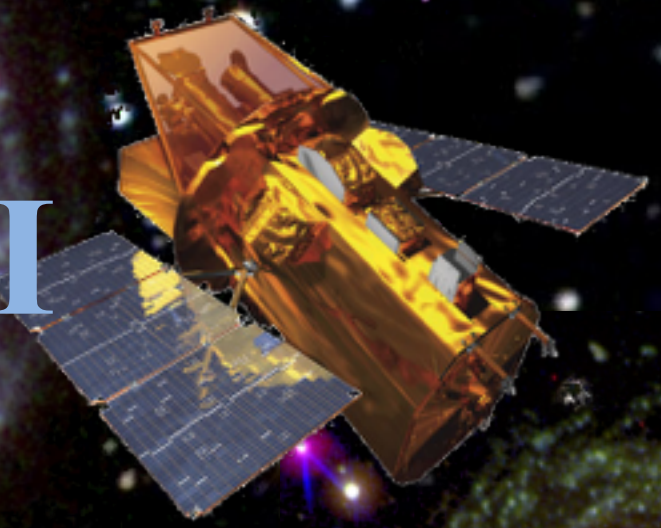
Ultraviolet Observations of Supernovae : The Peril and The Promise II



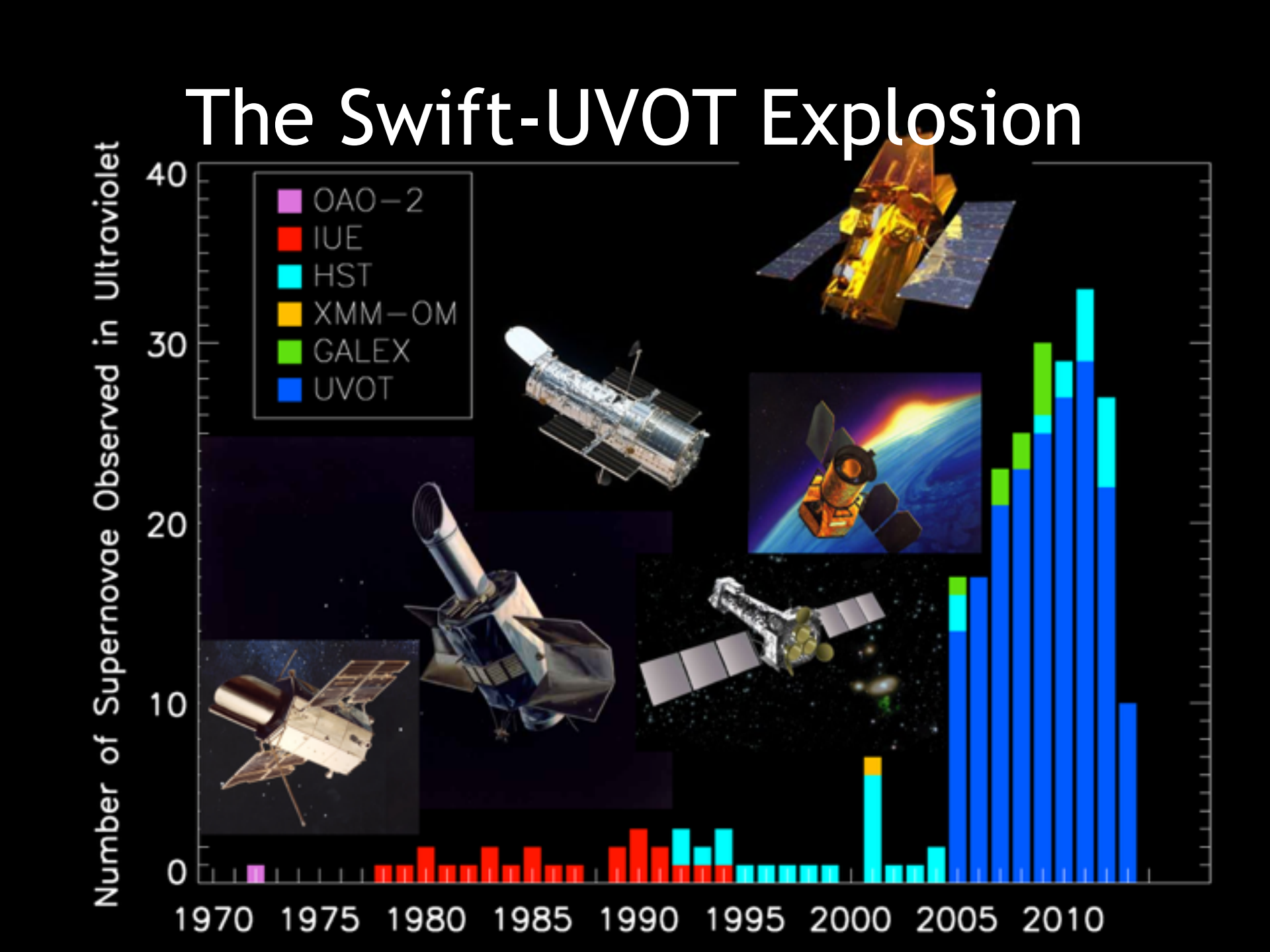
Peter J. Brown
Mitchell Institute -- Texas A&M
Cook's Branch Workshop, Apr 13, 2016

The Peril and the Promise I

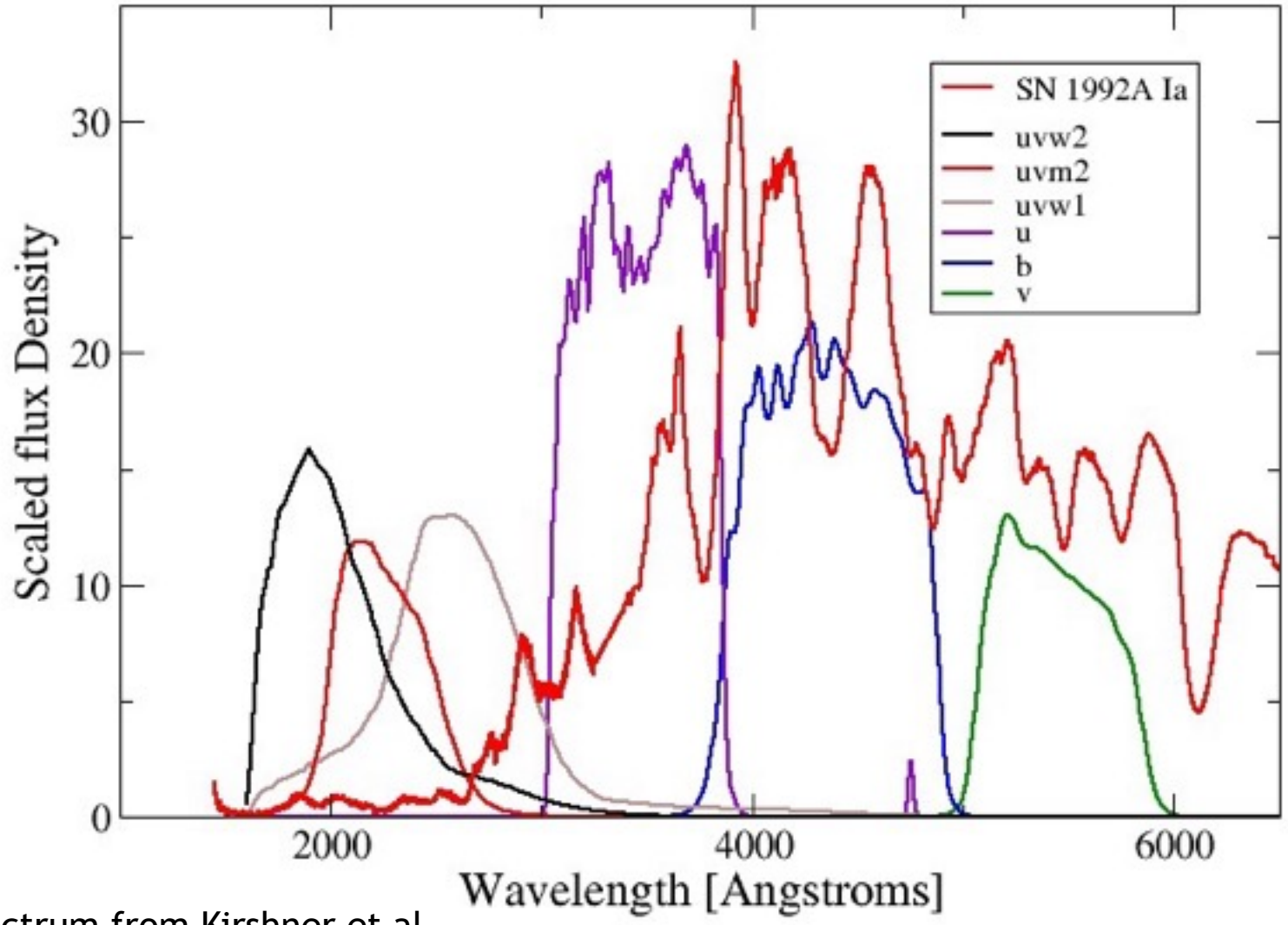
- UV light of supernovae is a mess of line blanketing, metallicity, extinction, asymmetry, density gradients, etc.

- UV light of supernovae can tell us about line blanketing, metallicity, extinction, asymmetry, density gradients, etc.

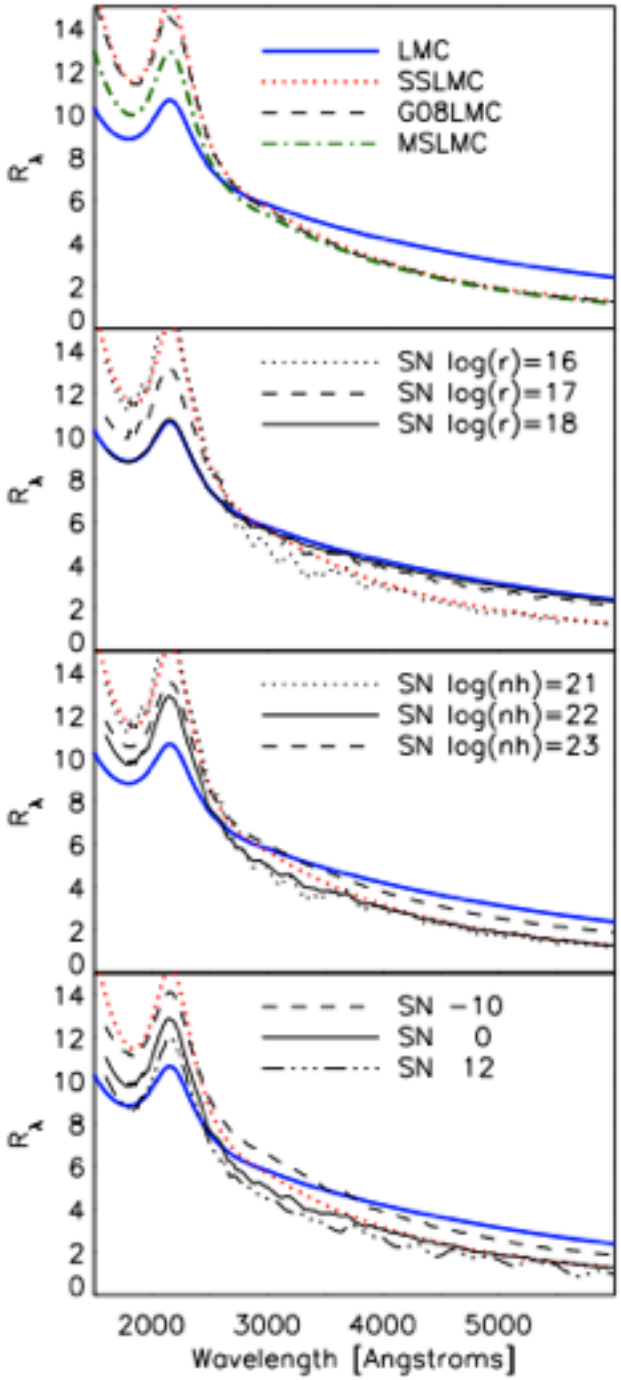
The Swift-UVOT Explosion



UVOT filters and SNe Ia



HST spectrum from Kirshner et al.

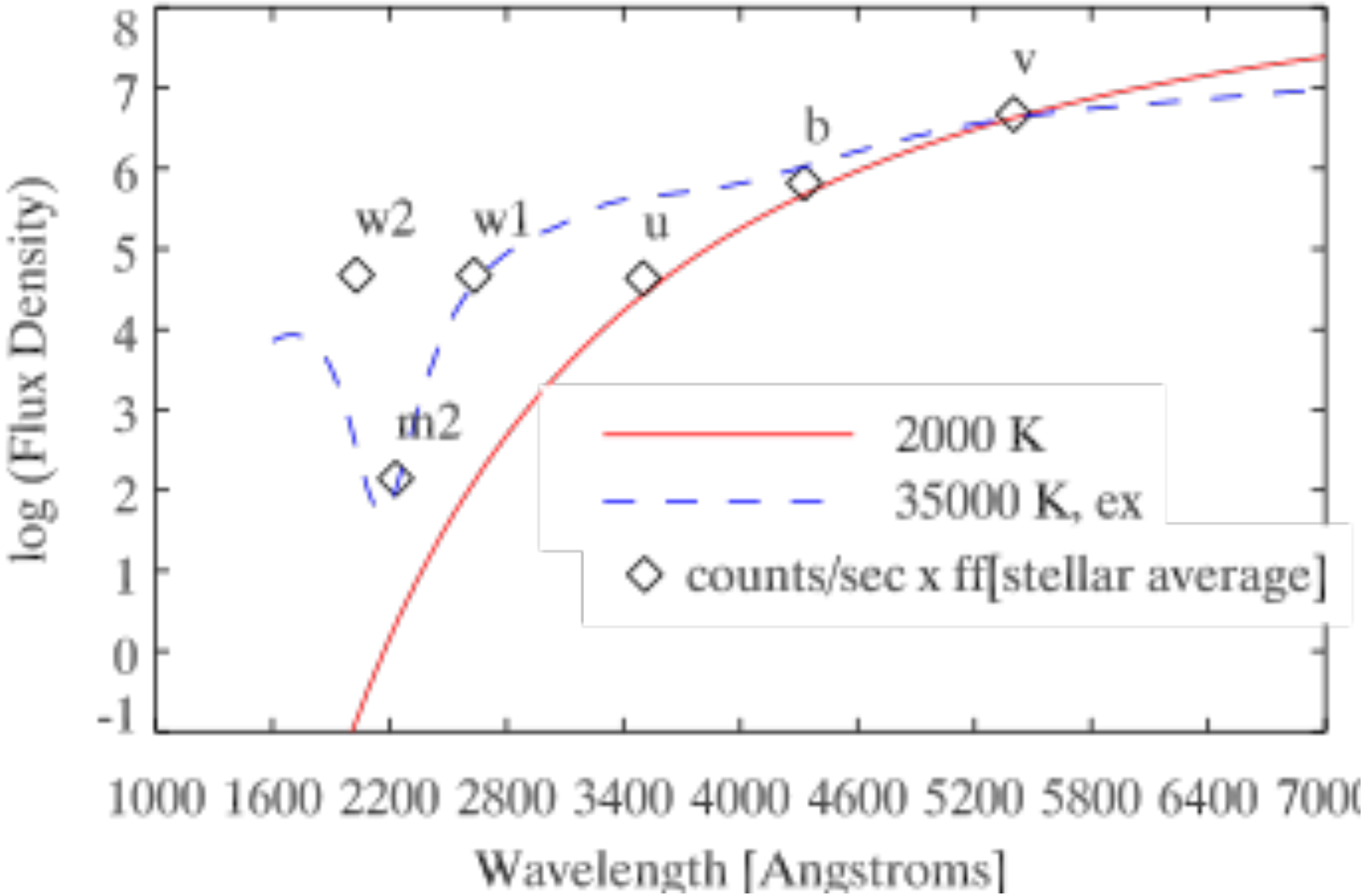


The Perils of Extinction: There is no unique extinction law resulting from circumstellar scattering

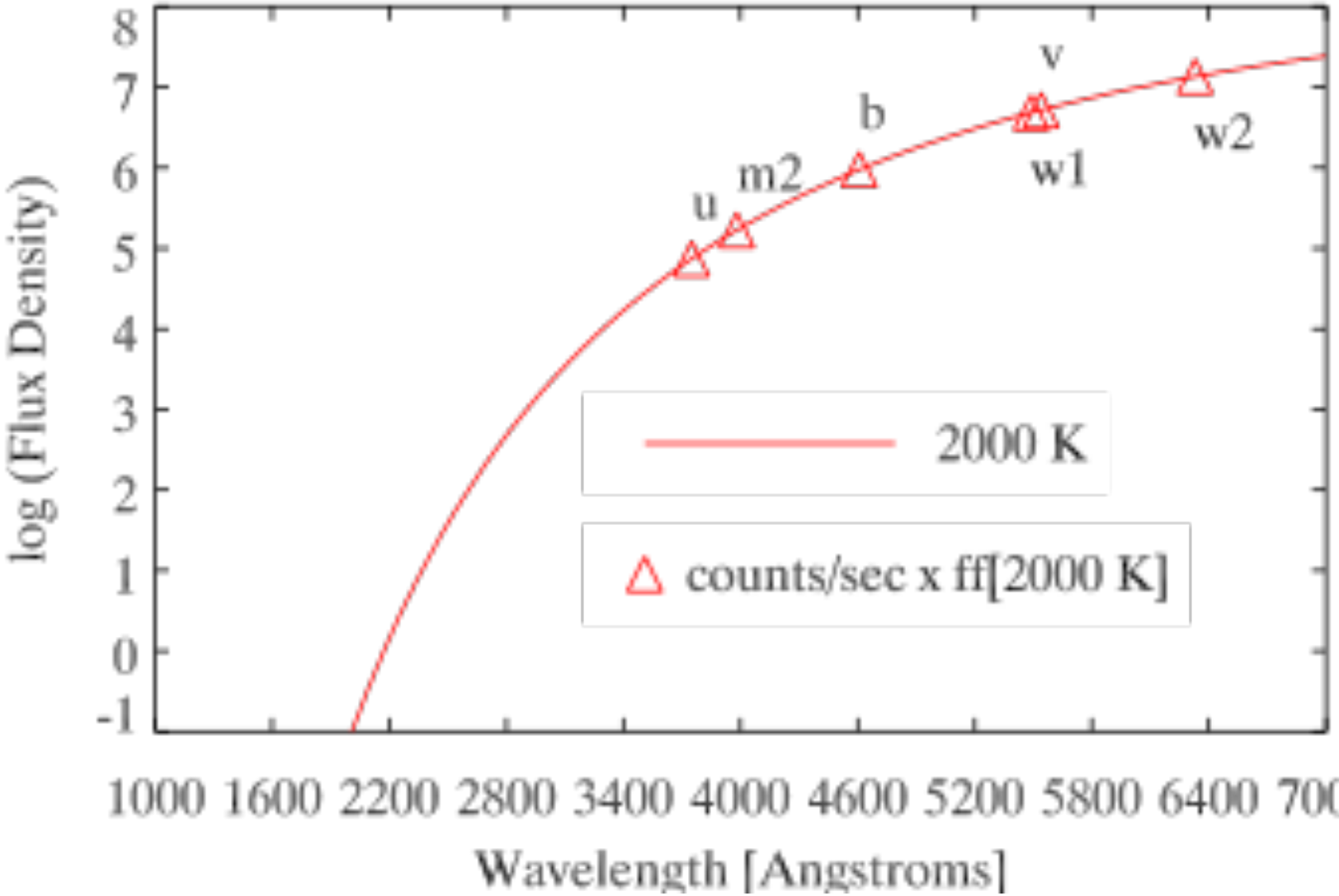
Because the intrinsic supernova light changes with time, the effective extinction law depends on the radius and column density of the scattering dust and the epoch it is observed. Also accompanied by broader light curves.

Brown et al. 2015

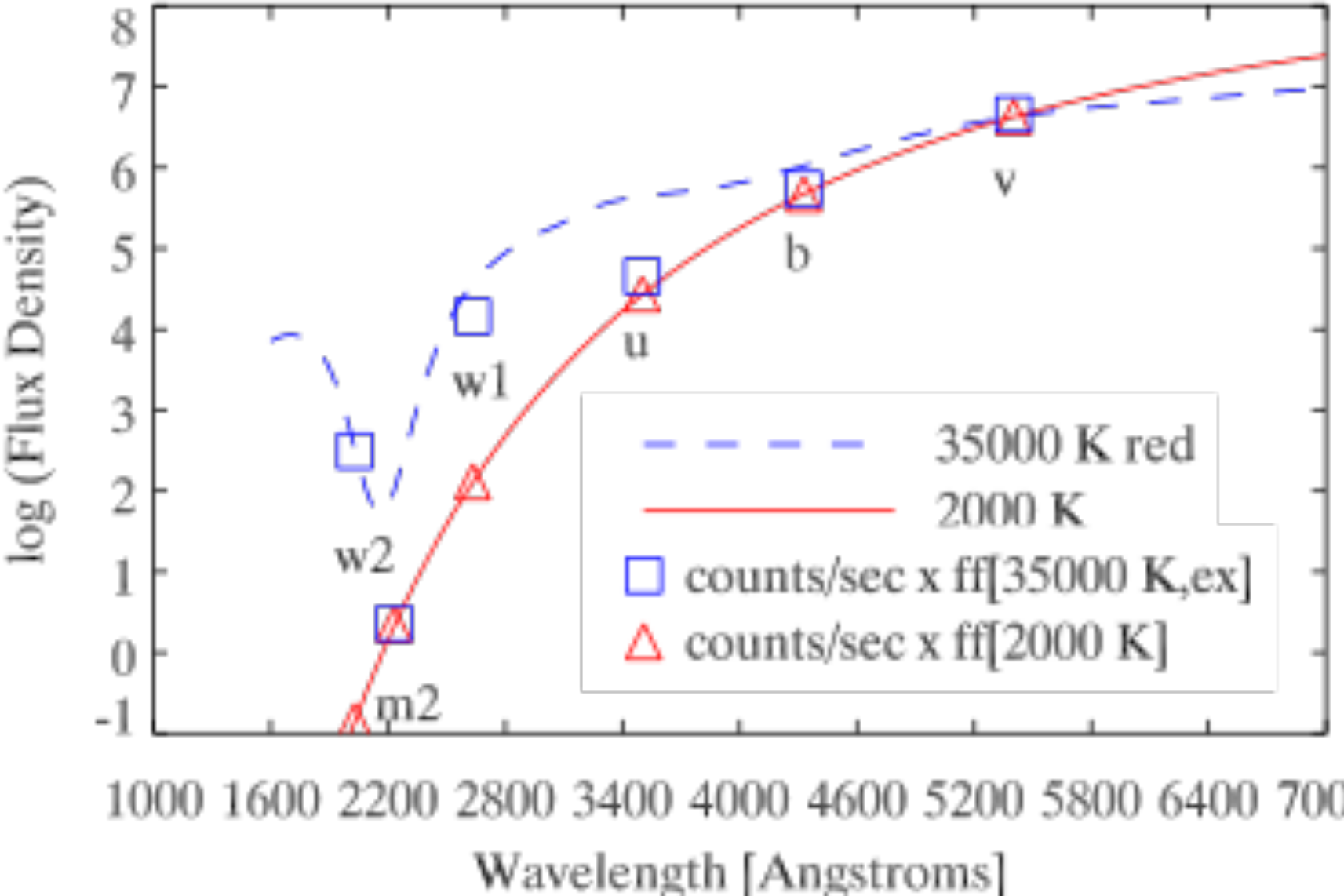
The Perils of Flux Conversion



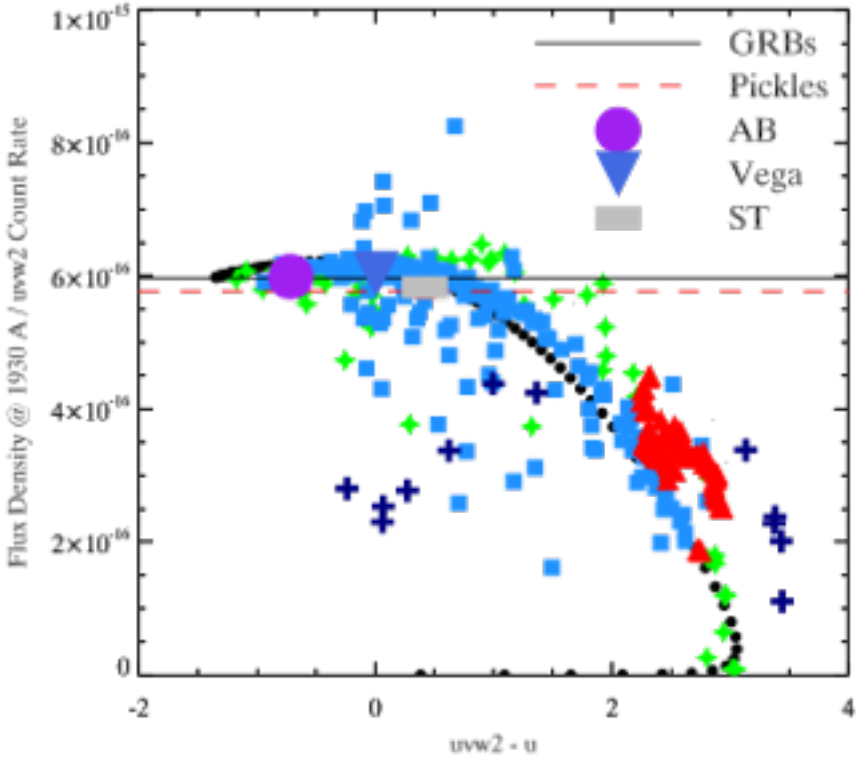
Recomputing effective wavelengths and flux conversion factors tests consistency

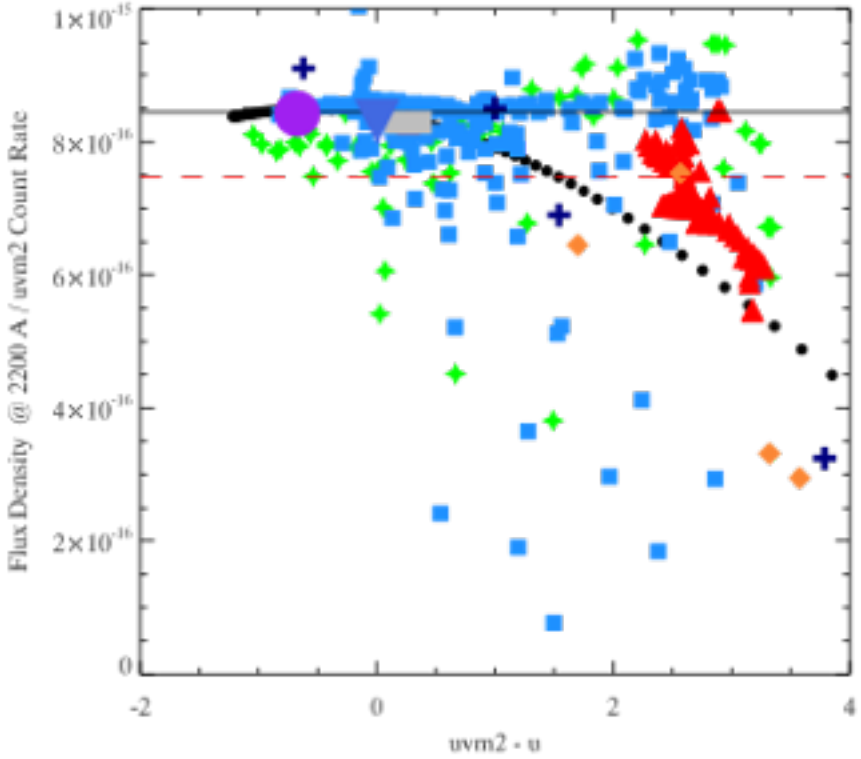


Or conversion factors are computed for fixed wavelength points

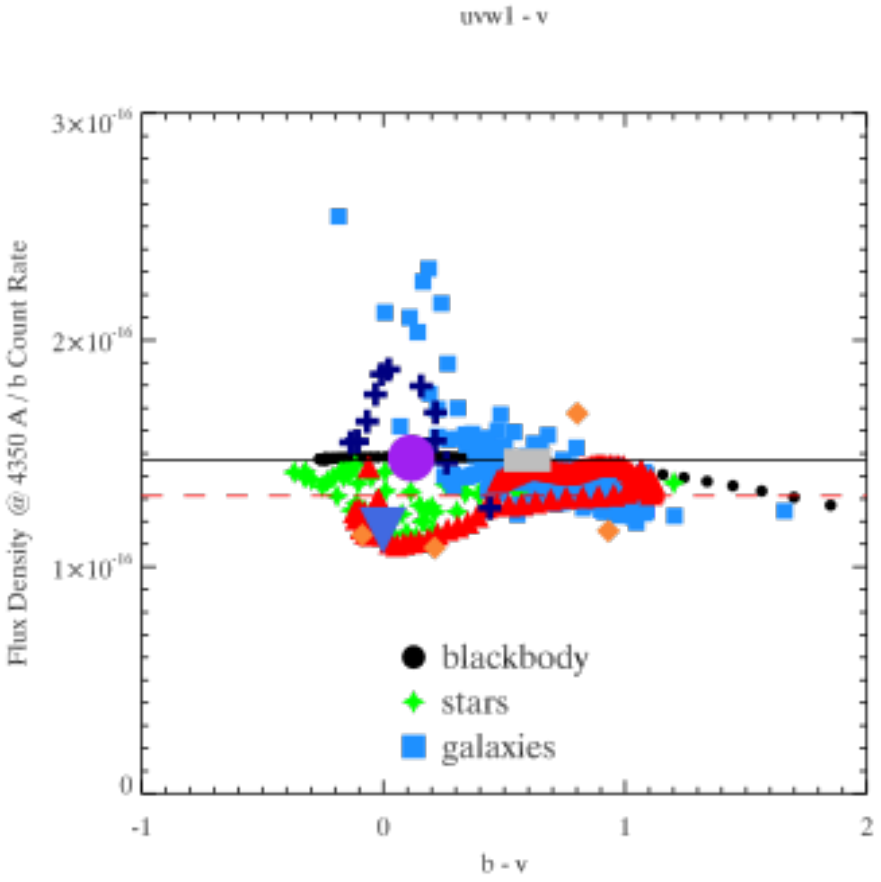


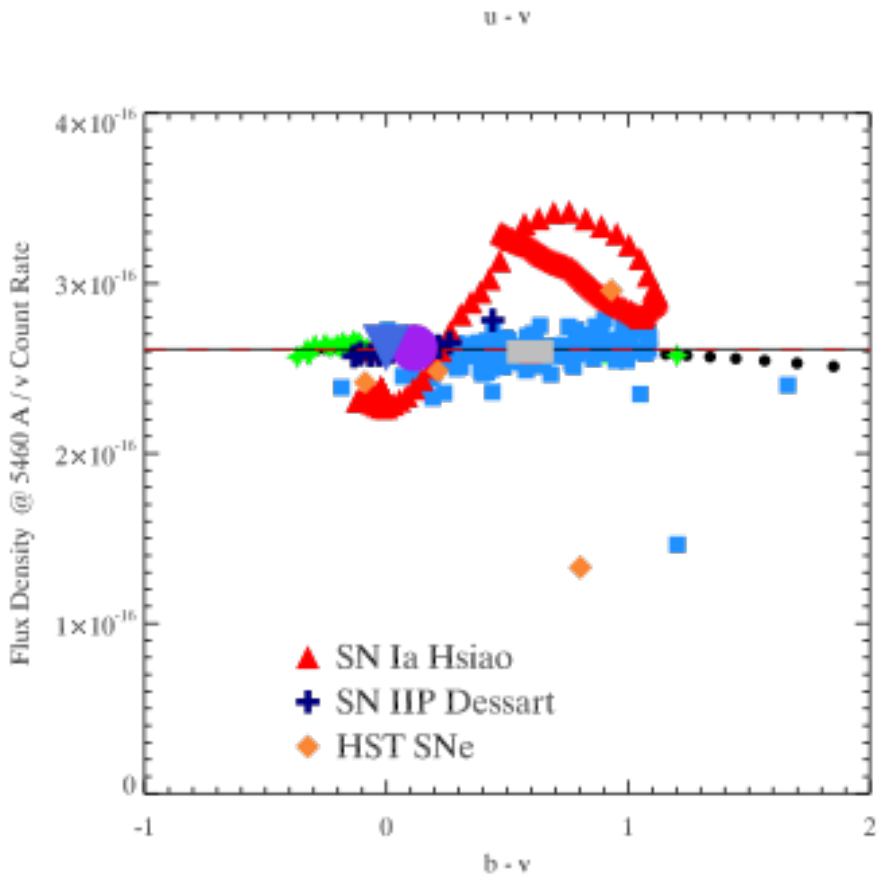
Flux Density Conversions vary by Spectral Type

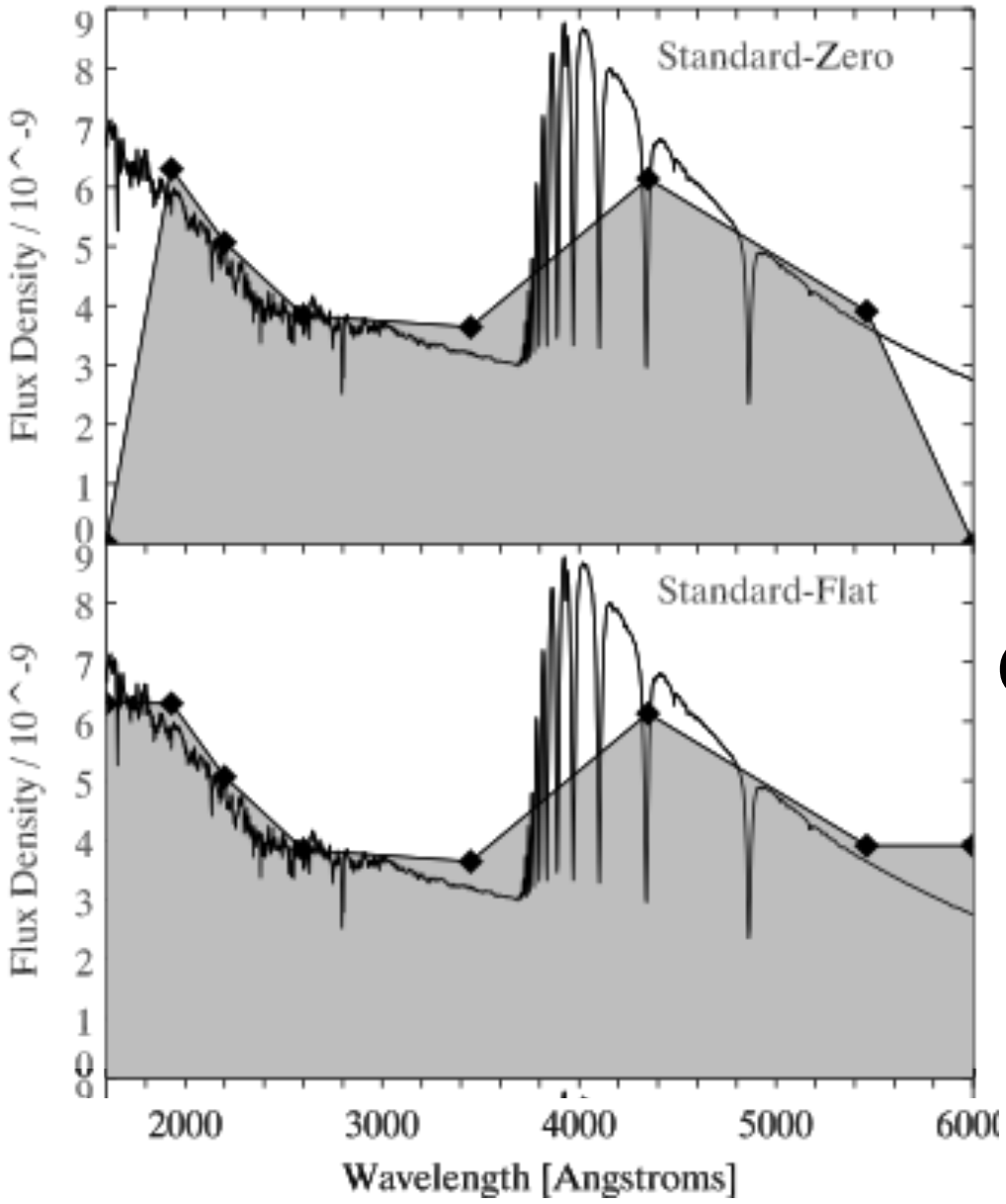




Flux Density Conversions vary by Spectral Type

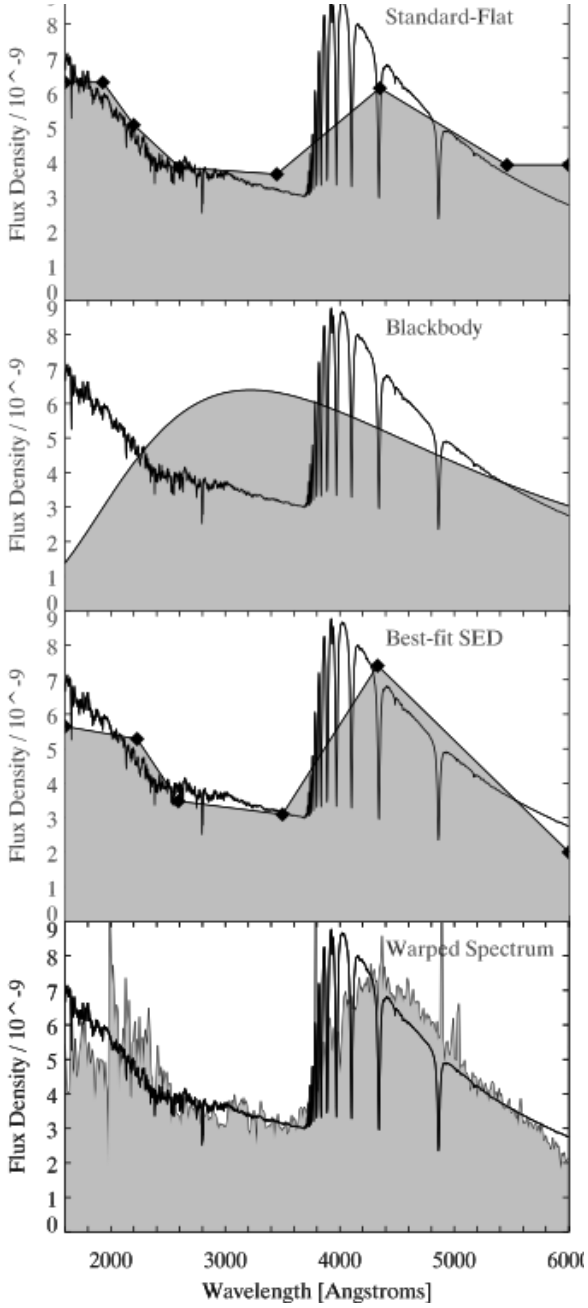






The Perils of Bolometry

How do you deal with limits of integration?

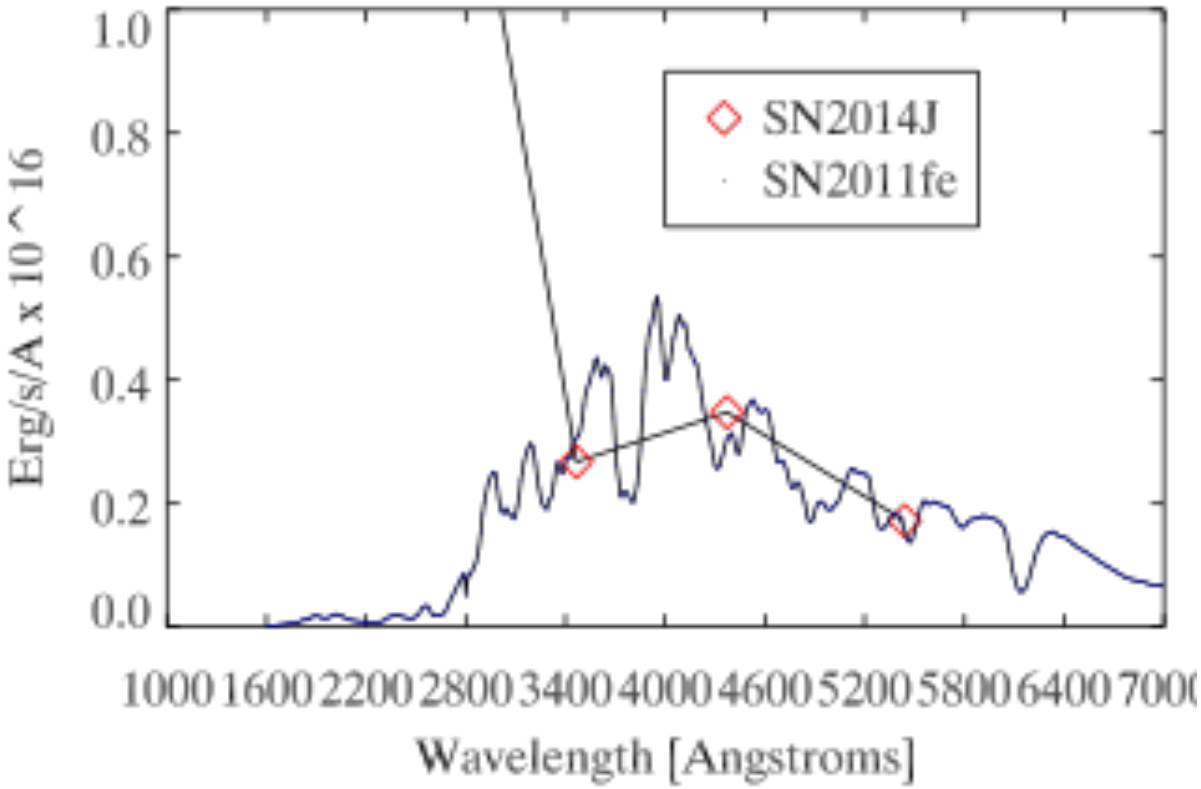


The Perils of Bolometry

How do you connect the dots?

The Perils of Bolometry

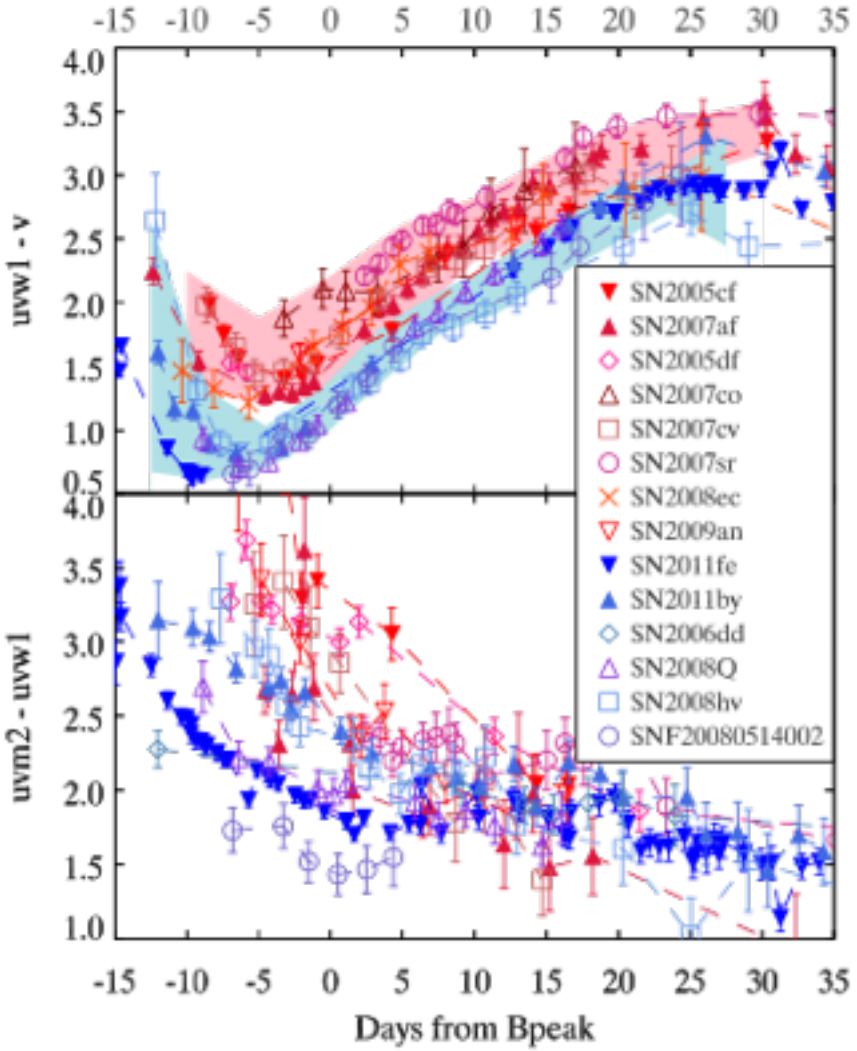
How do you correct for extinction?



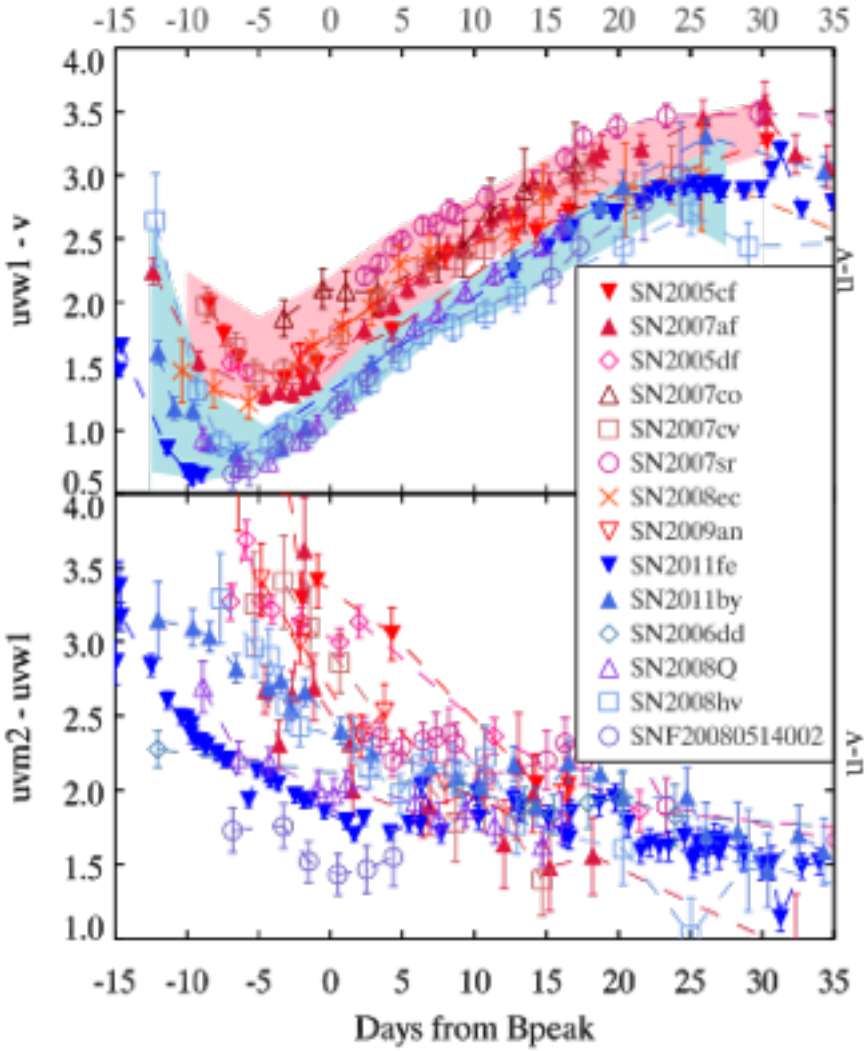
Extinction corrections are SED dependent

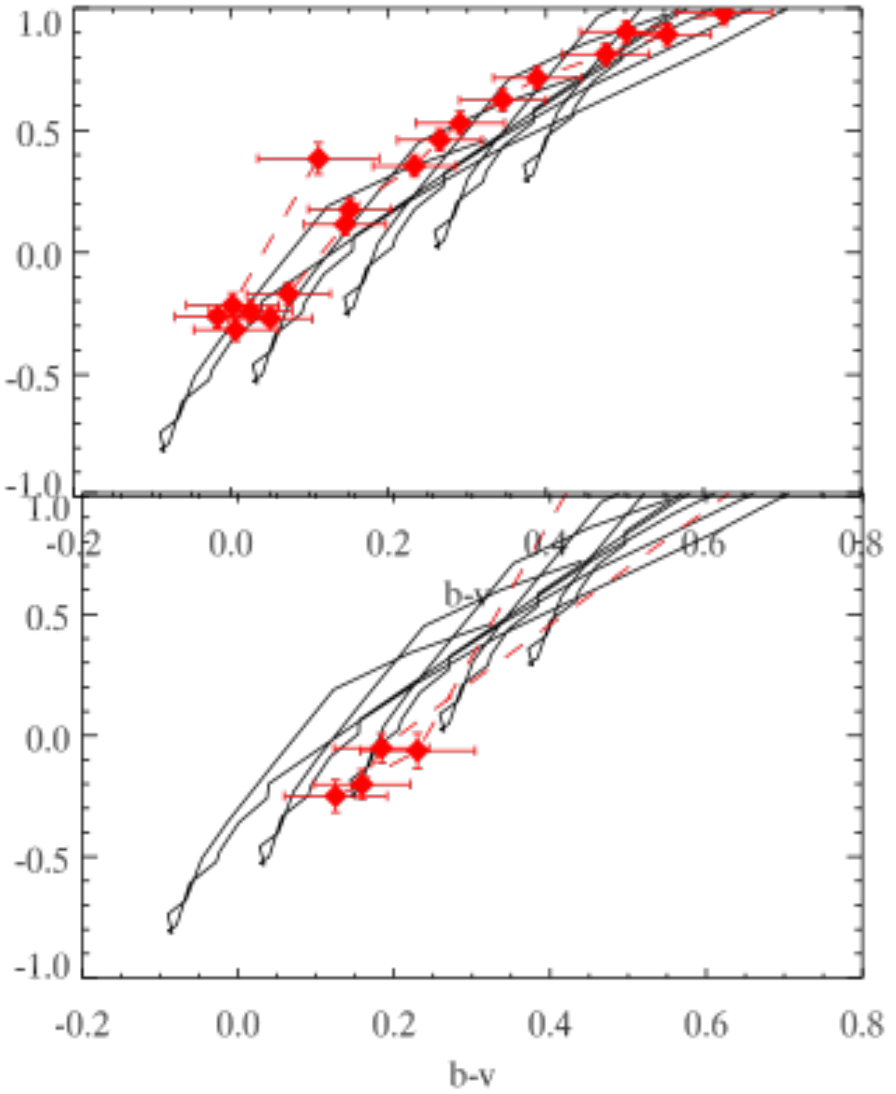
Bottom Line : understand the assumptions being made when you integrate a bolometric flux/ luminosity

Swift UVOT observations show a possible split in normal SNe Ia



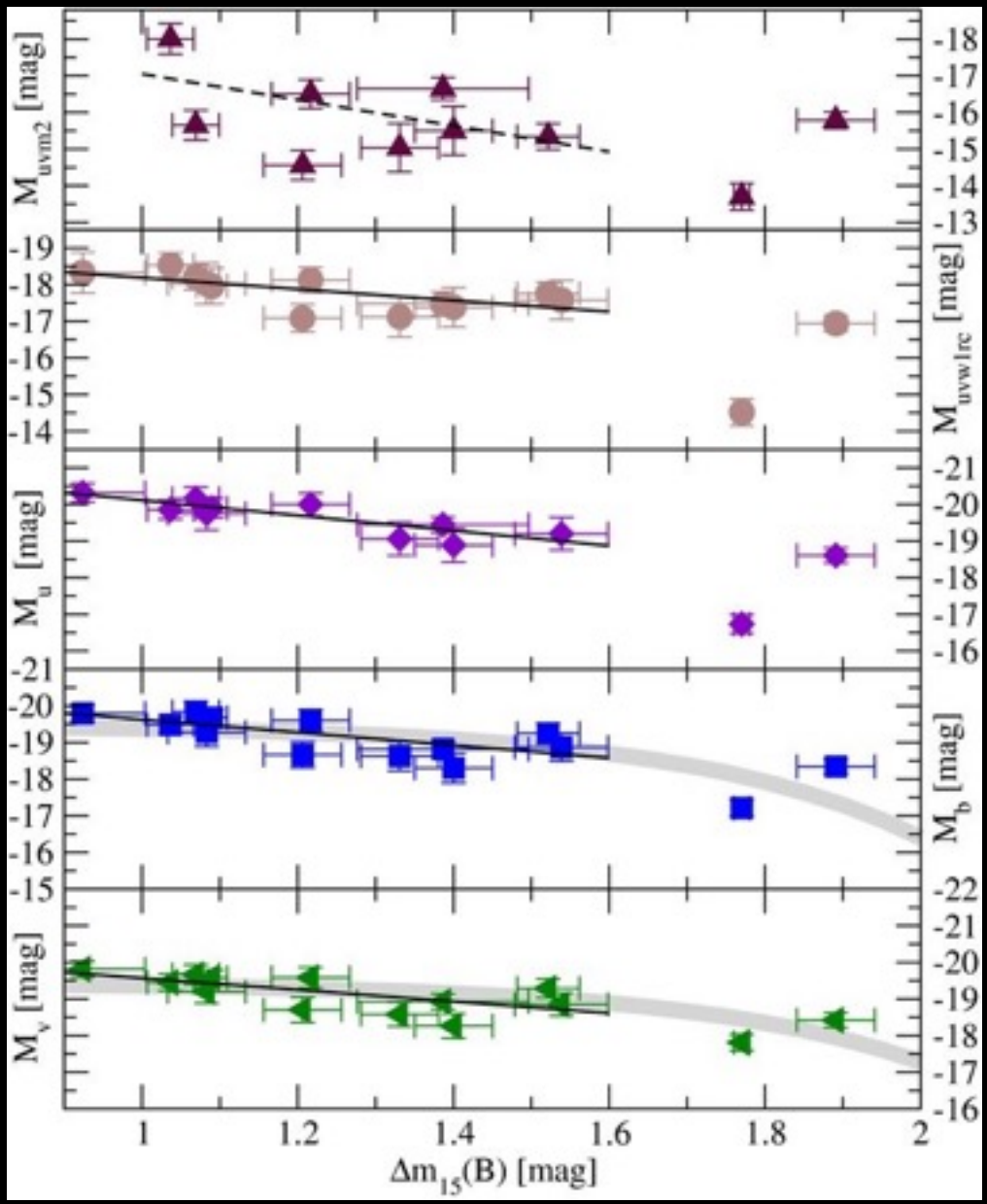
Color-color plots can distinguish between red and reddened





UV Absolute Magnitudes

Original sample of twelve from Brown et al. 2010 (my thesis)



M w2

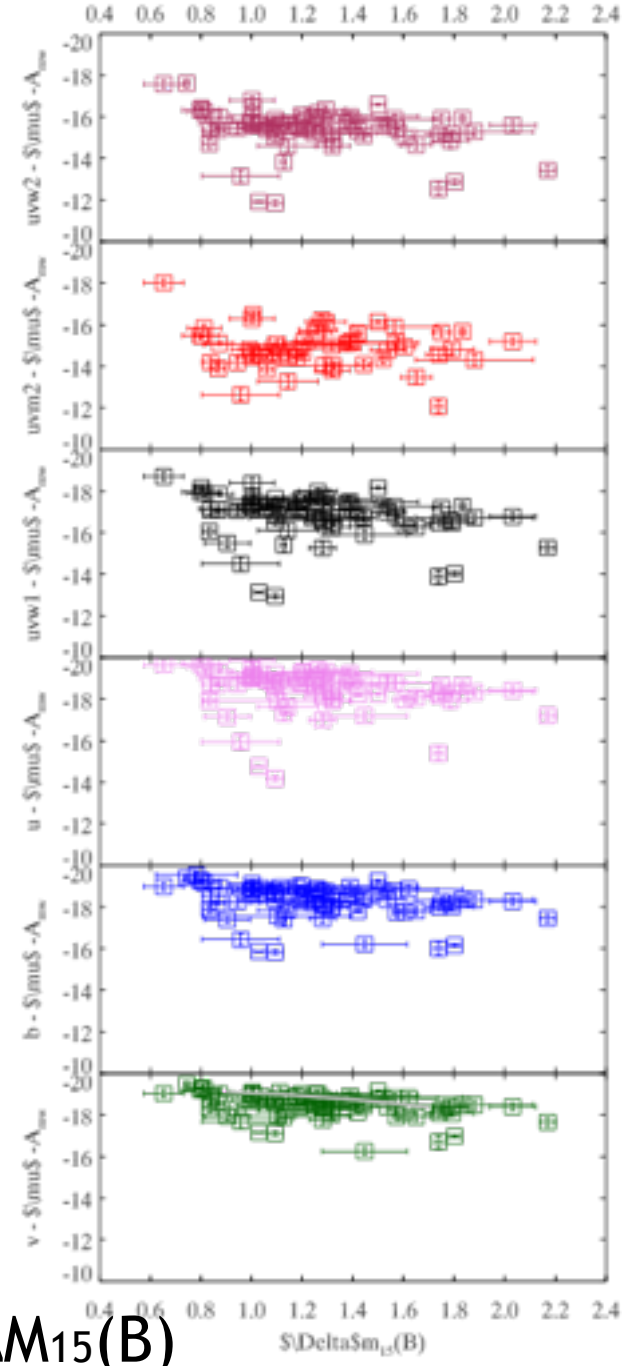
M m2

M w1

M u

M b

M v



ΔM_{15}(B)

M w2

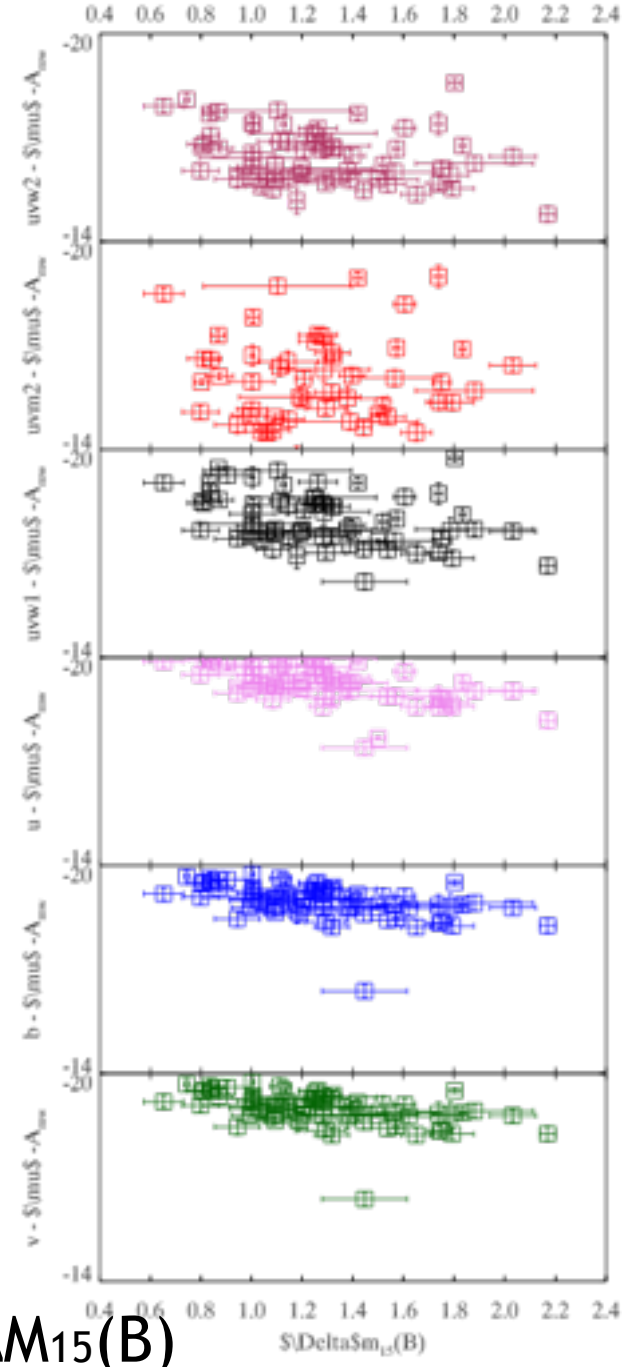
M m2

M w1

M u

M b

M v



$\Delta M_{15}(B)$

Fix the color using the optical

M w2

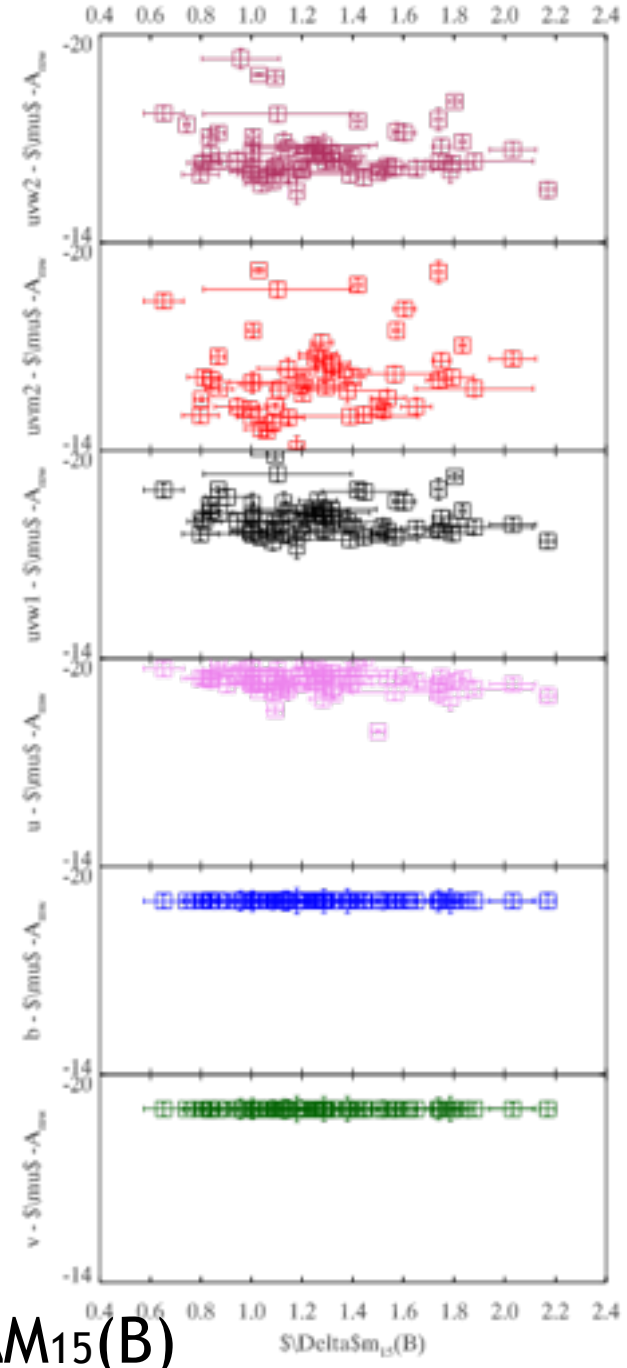
M m2

M w1

M u

M b

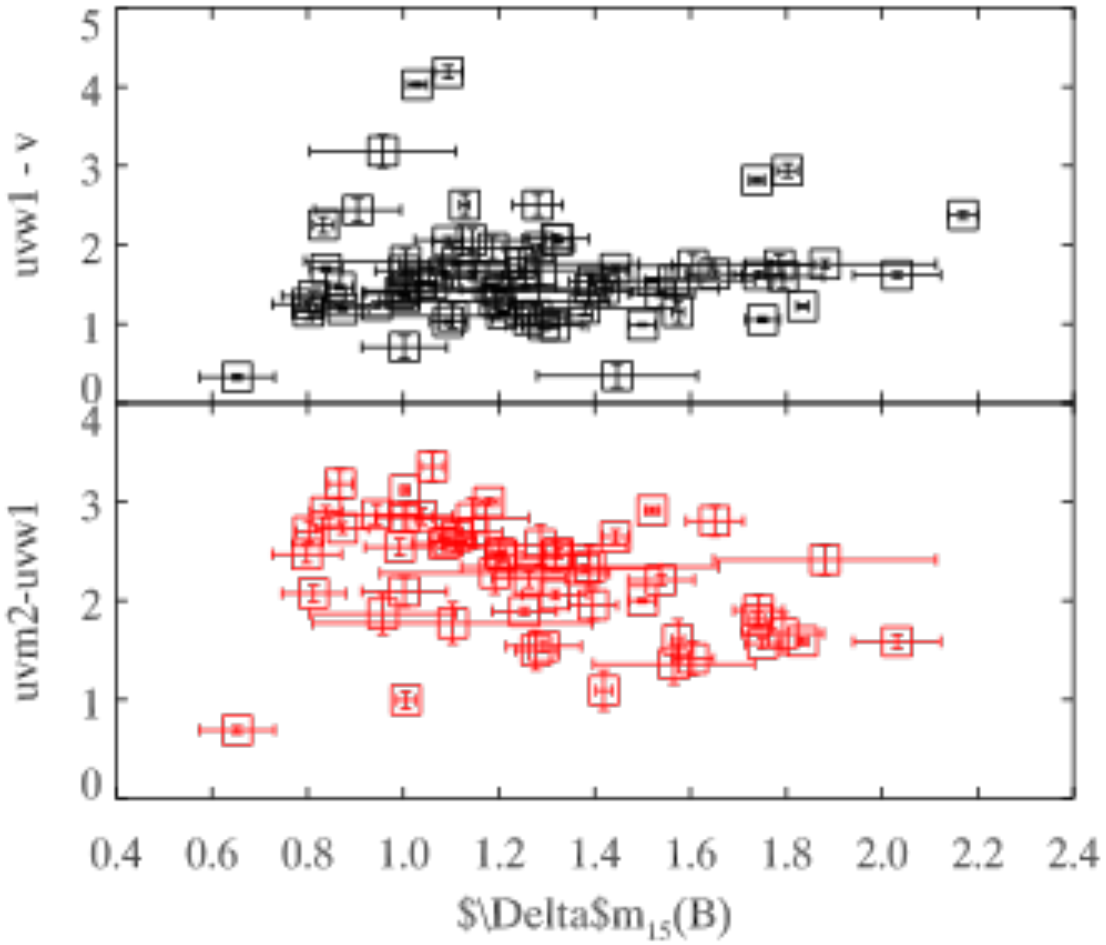
M v



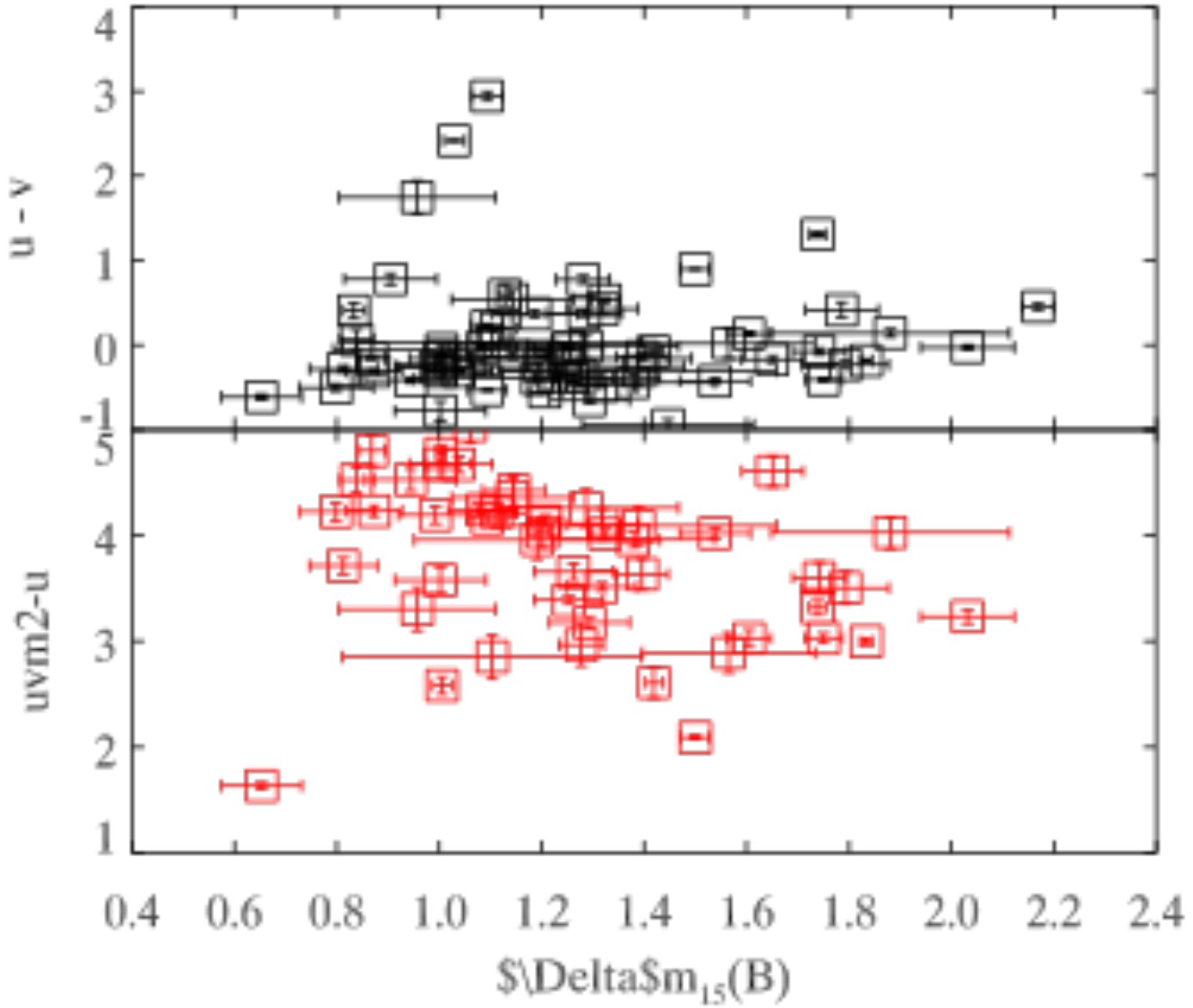
Fix the color and the distance modulus using the optical

ΔM_{15}(B)

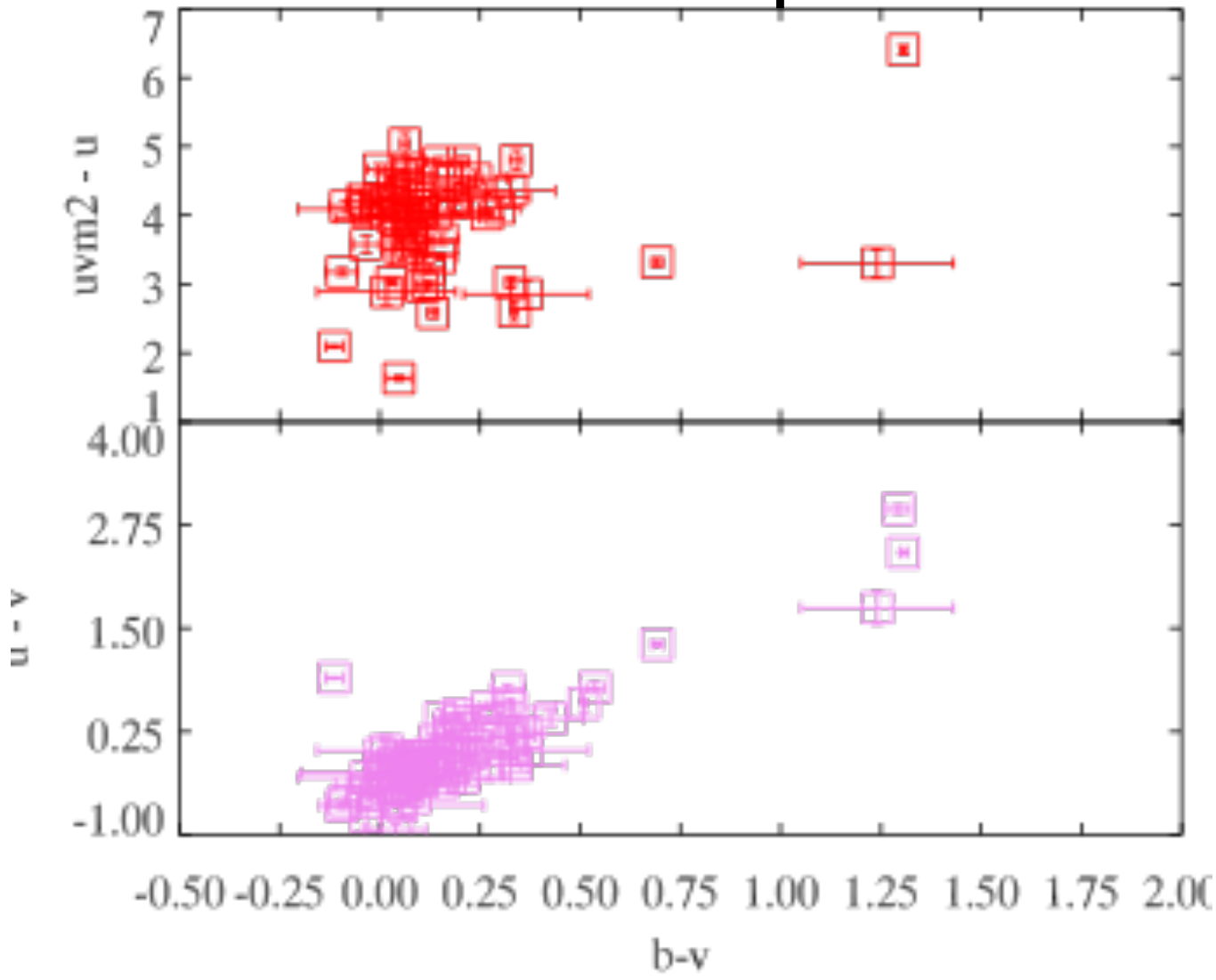
UV colors show large dispersion



UV colors show large dispersion



Some colors follows a reddening vector, but most of the mid-UV dispersion is intrinsic



- [Raw Images]
- Organized Images
  (incl. templates)
- Photometry Products
  (count rates, backgrounds, corrections)
- Final Photometry
- SED-dependent products

(flux values, extinction factors, etc.)

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Astrophysics Data Analysis Program

UV Observations have great promise to understand the physics of supernovae, especially the density and metallicity of the very outer layers