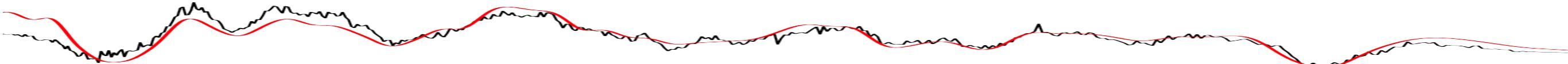


The local environment of SNe Ia seen with Integral Field Spectroscopy

Lluís Galbany (U. Pittsburgh)

Second order corrections: Environment



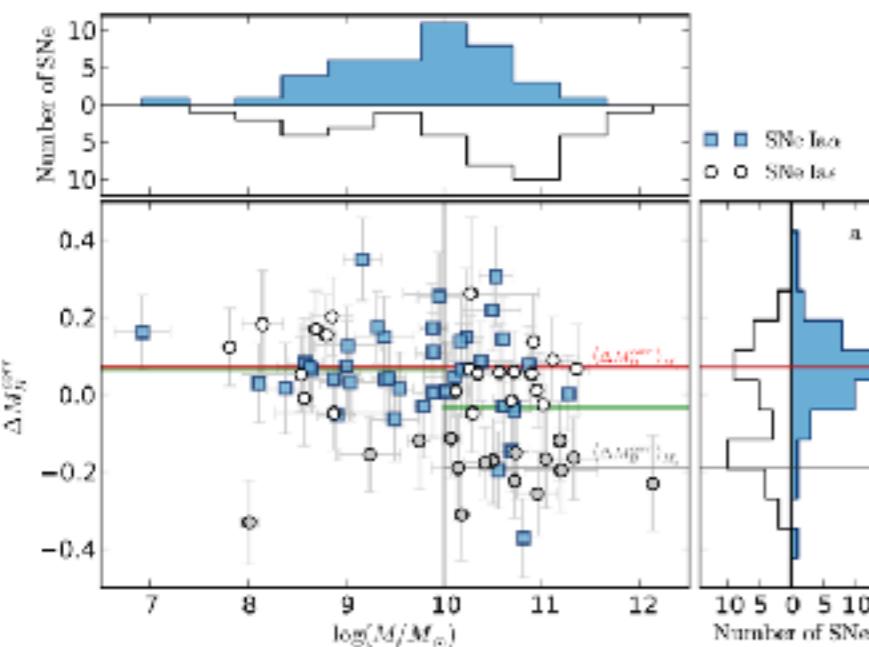
Look for dependences of the SN properties on the host galaxy properties (focused on global characteristics of the host)

As they evolve with redshift, such dependences would impact the cosmological parameters

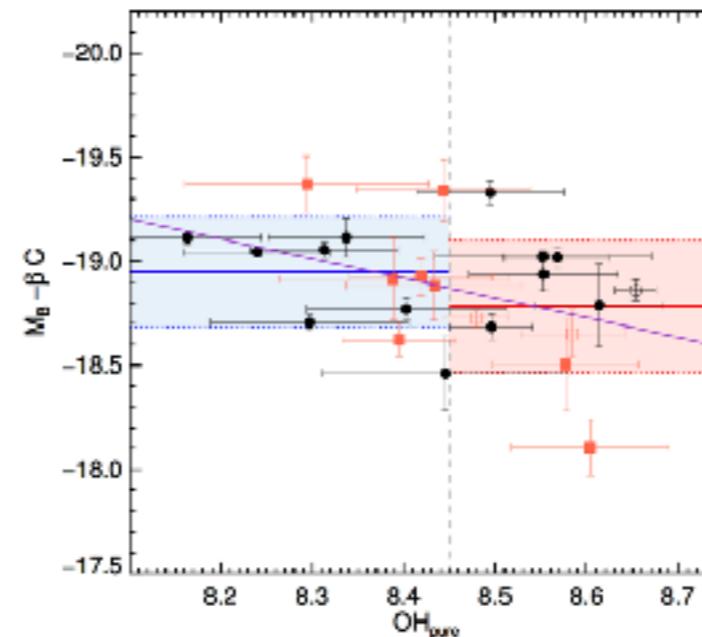
- Hamuy et al. (1996) Bright events occur preferentially in **young** stellar environments.
Hamuy et al. (2000) Luminous SNe are produced in **metal-poor** neighborhoods
Gallagher et al. (2005) **high-metallicity** galaxies host SNe Ia with negative HR (*after LC-corr*)
Sullivan et al. (2006) Brighter events are found in systems with ongoing **star-formation**
Gallagher et al. (2008) **Progenitor age** primarily determines the peak luminosity
Hicken et al. (2009) SN Ia in **spiral** hosts are intrinsically fainter (*after LC-corr*)
Howell et al. (2009) **more massive** progenitors give rise to less luminous explosions
Neill et al. (2009) **Older** hosts produce less-extincted SNe Ia
Cooper et al. (2009) SNIa are more luminous or more numerous in **metal-poor** galaxies
Brandt et al. (2010) Luminous SNe associated with recent **star-formation** and **young** prog.
Sullivan et al. (2010) SNIa are brighter in **massive** hosts (metal-rich) and with low **SFR** (*after LC-corr*)
Kelly et al. (2010) SN Ia in physically **larger**, more **massive** hosts are ~10% brighter
Lampeitl et al. (2010) introduce the stellar **mass** of the host in the parametrization
D'Andrea et al. (2011) SNe are 0.1 mag brighter in **high-metallicity** hosts after corr.
Gupta et al. (2011) **older** galaxies host SNe Ia that are brighter
Konishi et al. (2011) SNe Ia in host galaxies with a higher **star formation** rate show brighter events
Galbany et al. (2012) SNe that explode **further** are less extinguished, and have **lower metallicity**
Childress et al. (2013) correlation between SN Ia intrinsic color and host **metallicity**
Johansson et al. (2013) more luminous SNe Ia appear in **younger** stellar progenitor systems
Rigault et al. (2013) SNe Ia with **local H α emission** are redder and drives the HR-**mass** relation
Pan et al. (2014) fainter, faster declining SNe Ia are hosted by **older/massive/metal-rich** galaxies
Moreno-Raya et al. (2016) SNe Ia luminosities tend to be higher for galaxies with **lower metallicities**
...

SN Ia local environment for cosmology

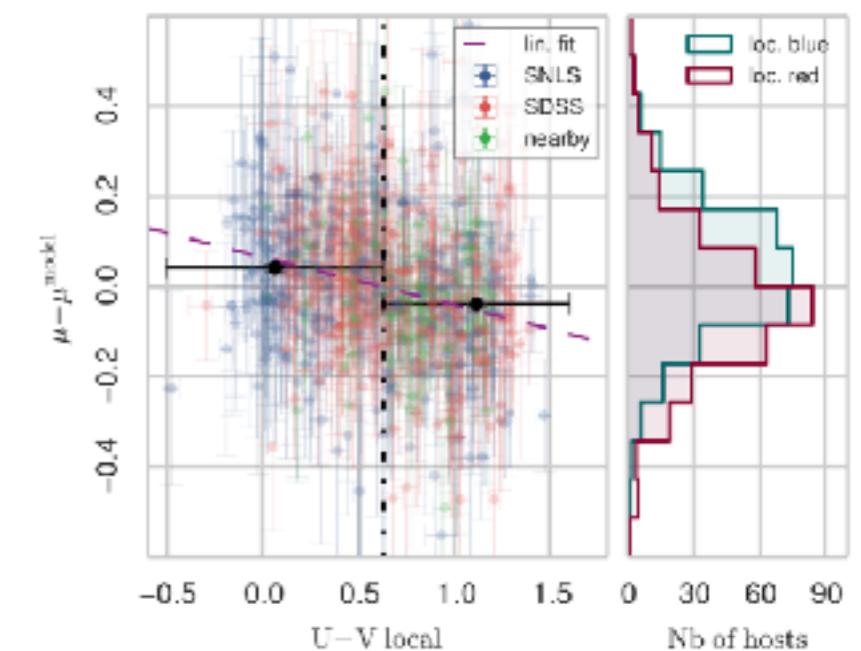
- SNIa are the best extragalactic distance indicators
- Their brightness is standardizable using 2 empirical relations:
 L_{peak} Vs color & L_{peak} Vs width
- Measured distances from standardized SN brightness depend on
GLOBAL host galaxy properties
- Just recently, some works have started looking at the **LOCAL environment**, finding some trends:



Rigault et al. 2013
SFR IFS ~1kpc

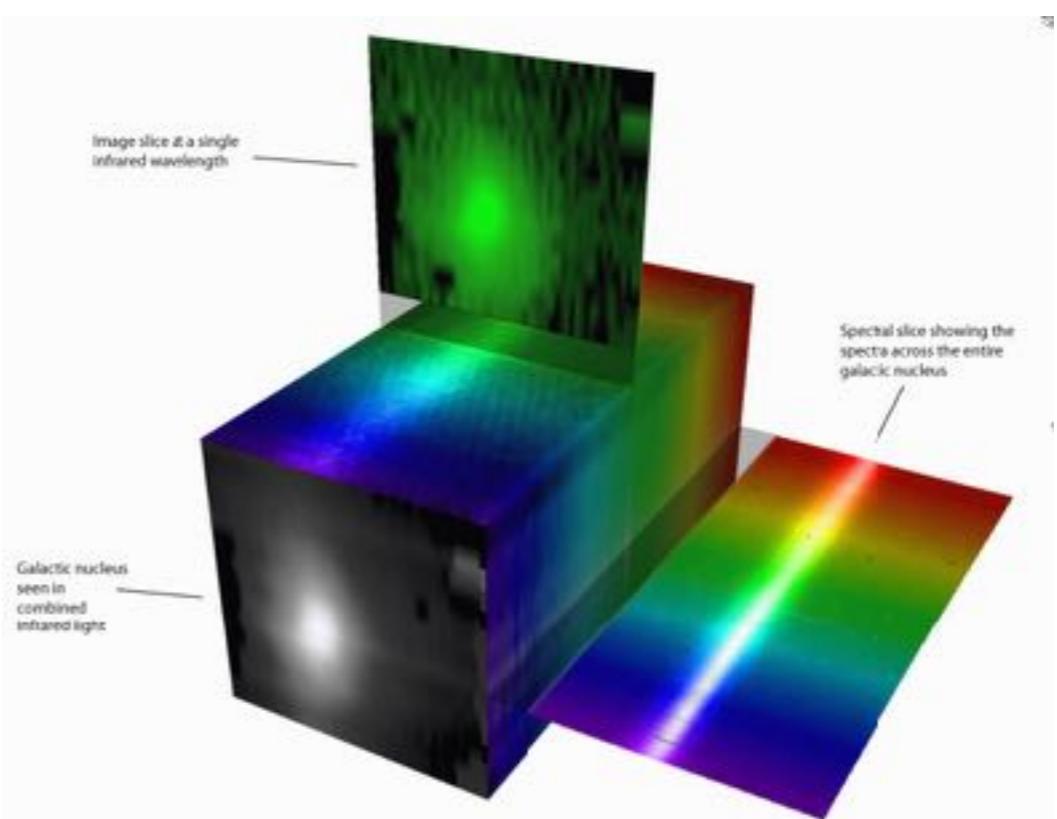
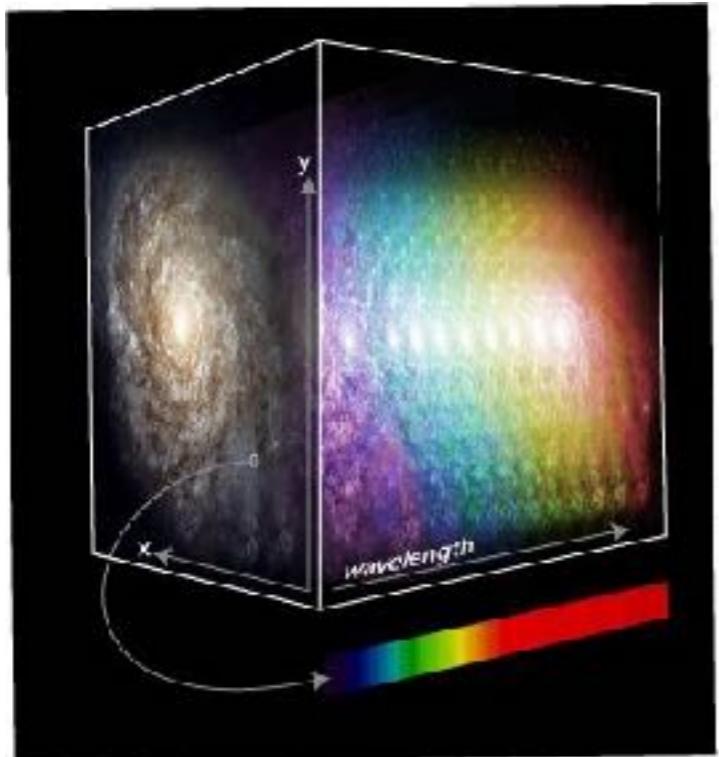
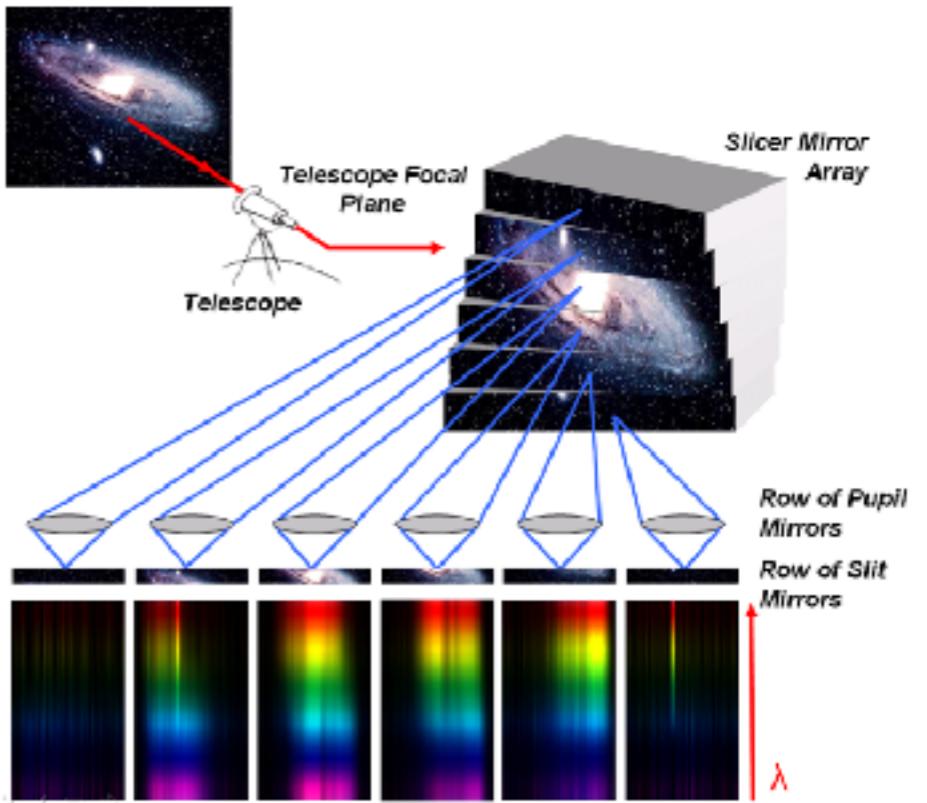
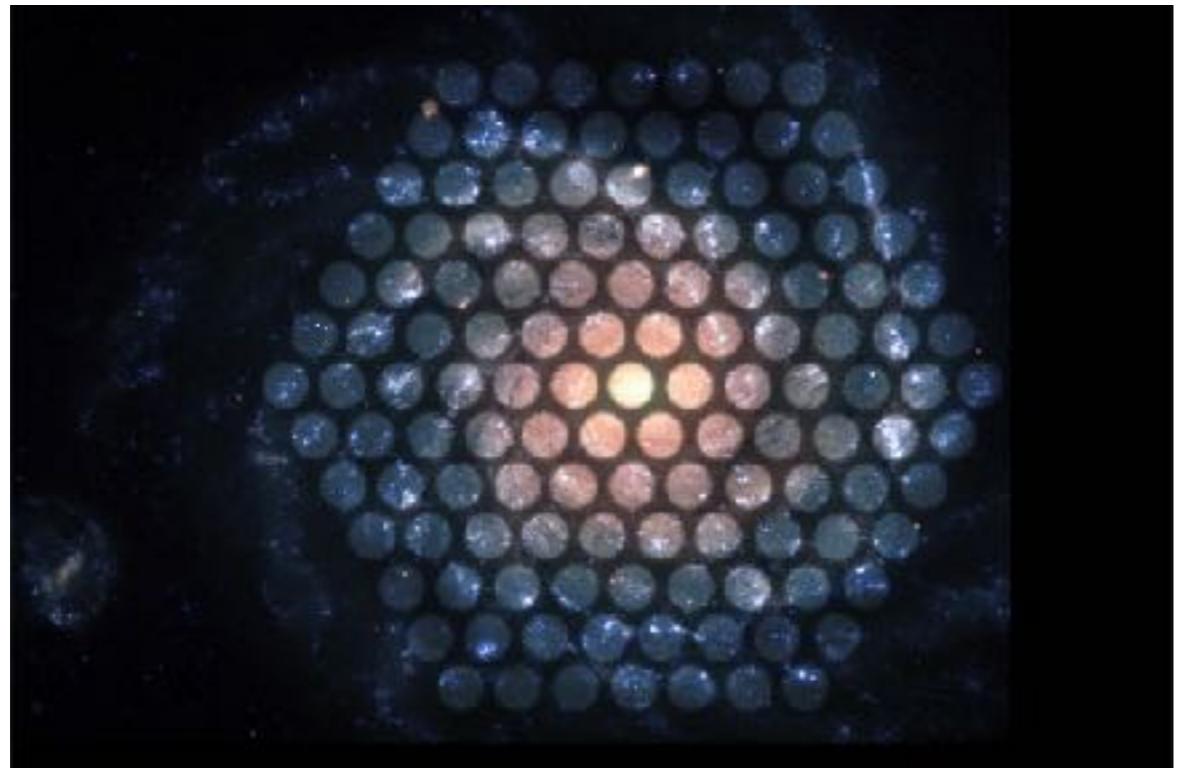


Moreno-Raya et al. 2016
OH LS ~ 1arcsec



Roman et al. 2017
U-V Phot ~3kpc

Integral Field Spectroscopy





PMAS

Calar Alto 3.5m



MUSE

Paranal 8.2m



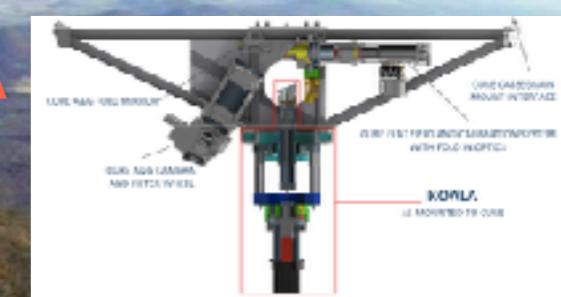
BOSS



APO 2.5m

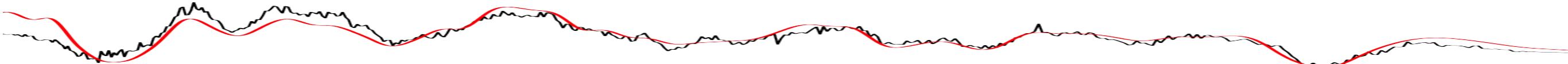


KOALA



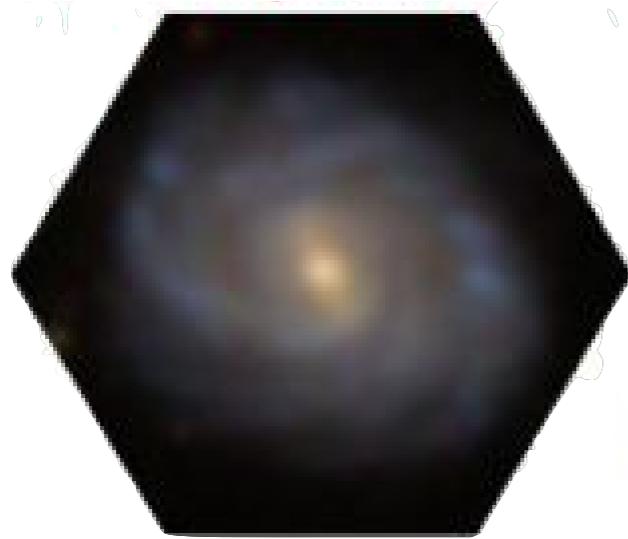
Siding Spring 3.9m

IFS data



PMAS

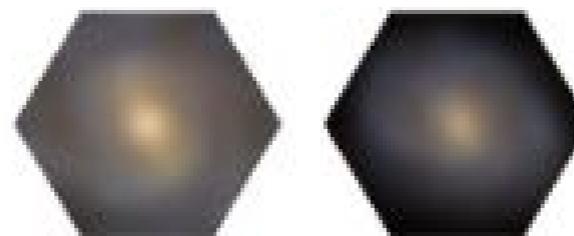
Field of view	70" x 70"
Spectral Resolution	R~500-1200
Number of spectra	~5,000 sp
Spatial Resolution	1"/spaxel
Wavelength coverage	3700-7500



MaNGA

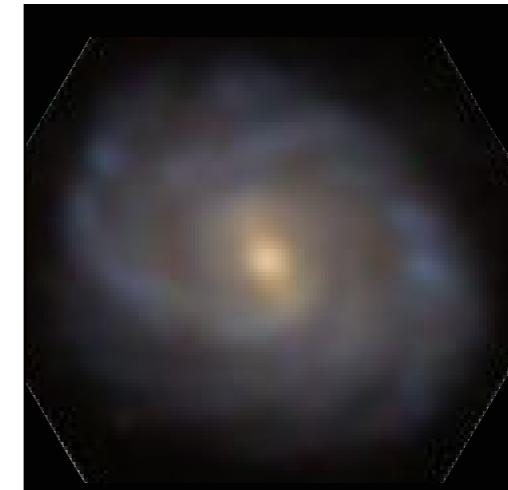
Field of view	30" x 30"
Spectral Resolution	R~2000
Number of spectra	~2,000 sp
Spatial Resolution	0.5"/spaxel
Wavelength coverage	3600-10000

FoV~1.5Re ~2.5Re



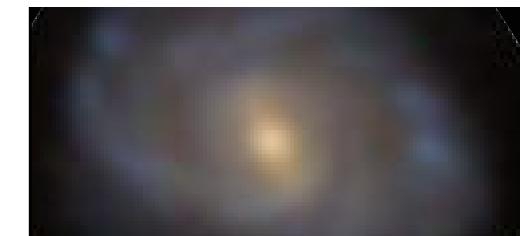
MUSE

Field of view	60" x 60"
Spectral Resolution	R~1700-3500
Number of spectra	~90,000 sp
Spatial Resolution	0.2"/spaxel
Wavelength coverage	4650-9300



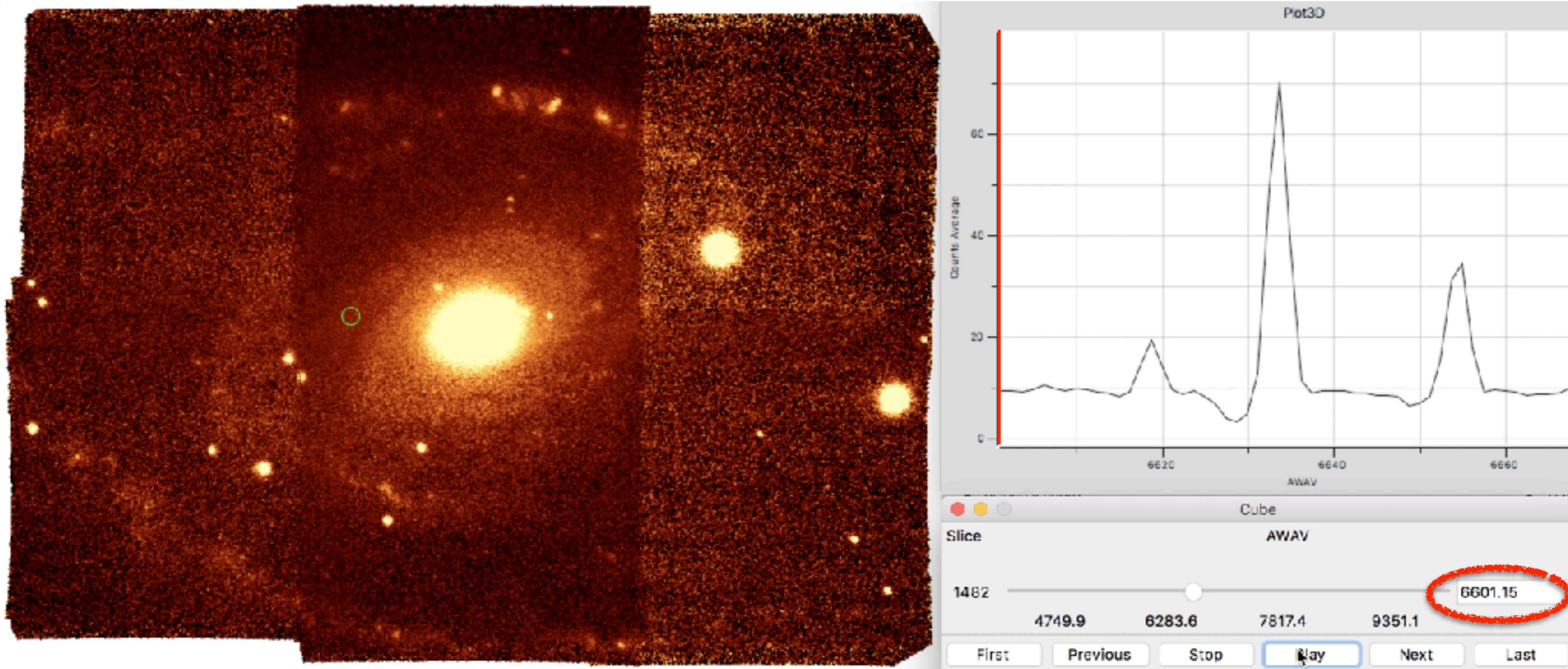
KOALA

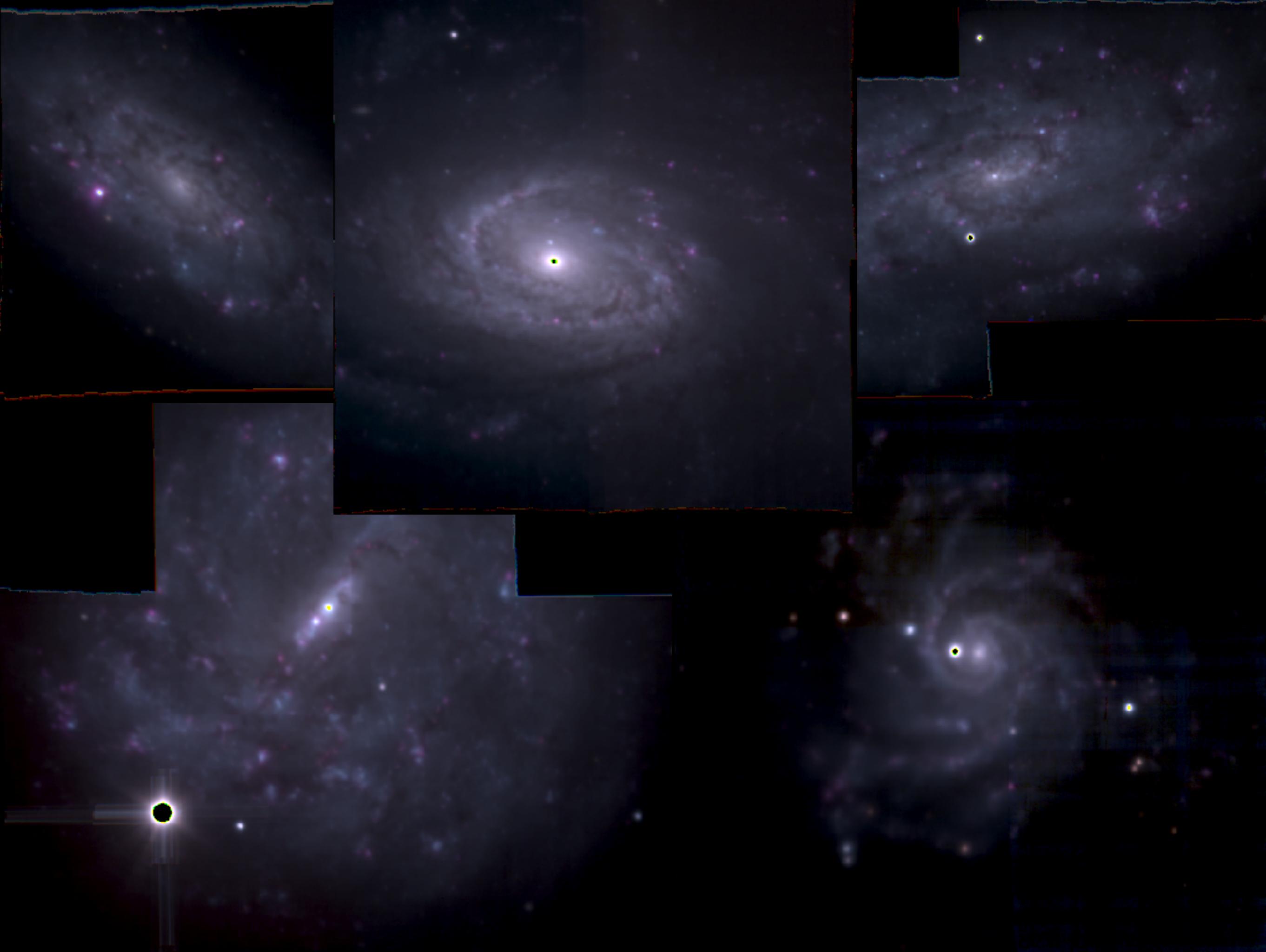
Field of view	30" x 60"
Spectral Resolution	R~1300-3700
Number of spectra	~1,000 sp
Spatial Resolution	0.5"/spaxel
Wavelength coverage	3700-8000



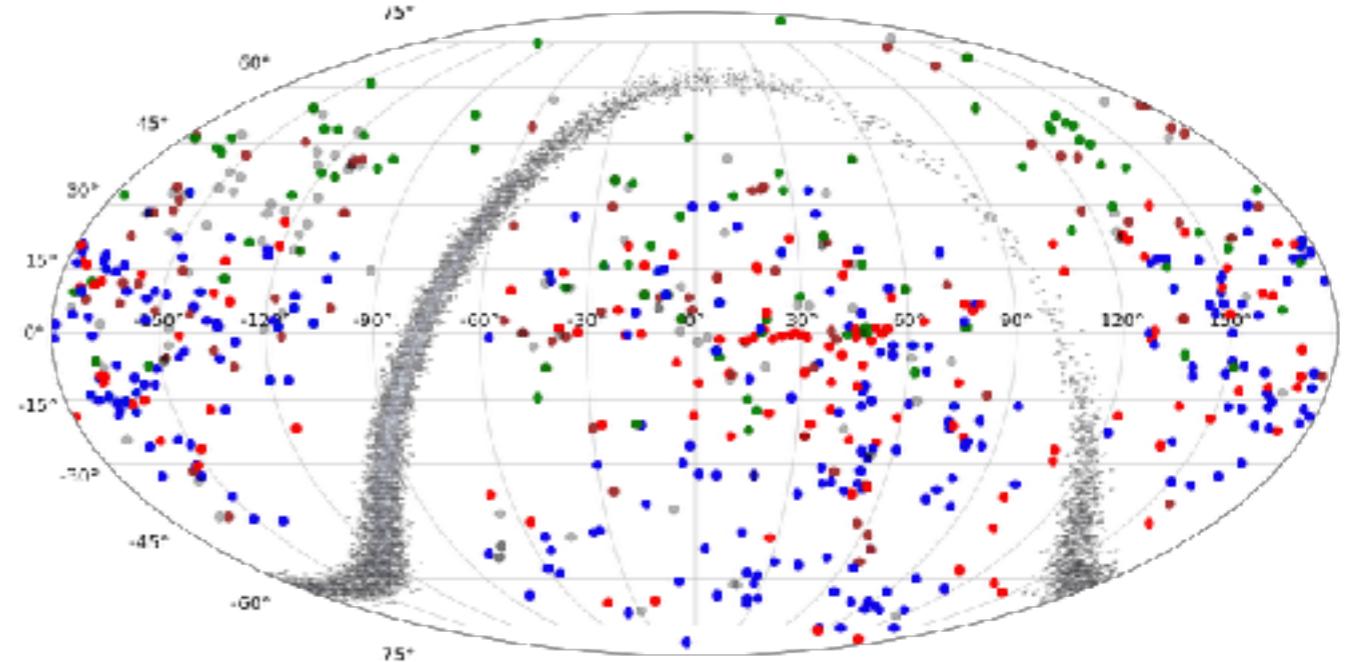
- Details
- Includes CALIFA DR3 and unpublished extensions, archival data, and PISCO (PI Galbany)
 - MaNGA public data (~3500 galaxies) + ancillary program for SN host galaxies (PI Galbany)
 - AMUSING survey data (PI Galbany/Anderson) and archival data
 - Includes Hi-KIDS and 18A semester data (PI Galbany)

All these complemented by ancillary UV+NIR photometry + new observations





SN-IFS data

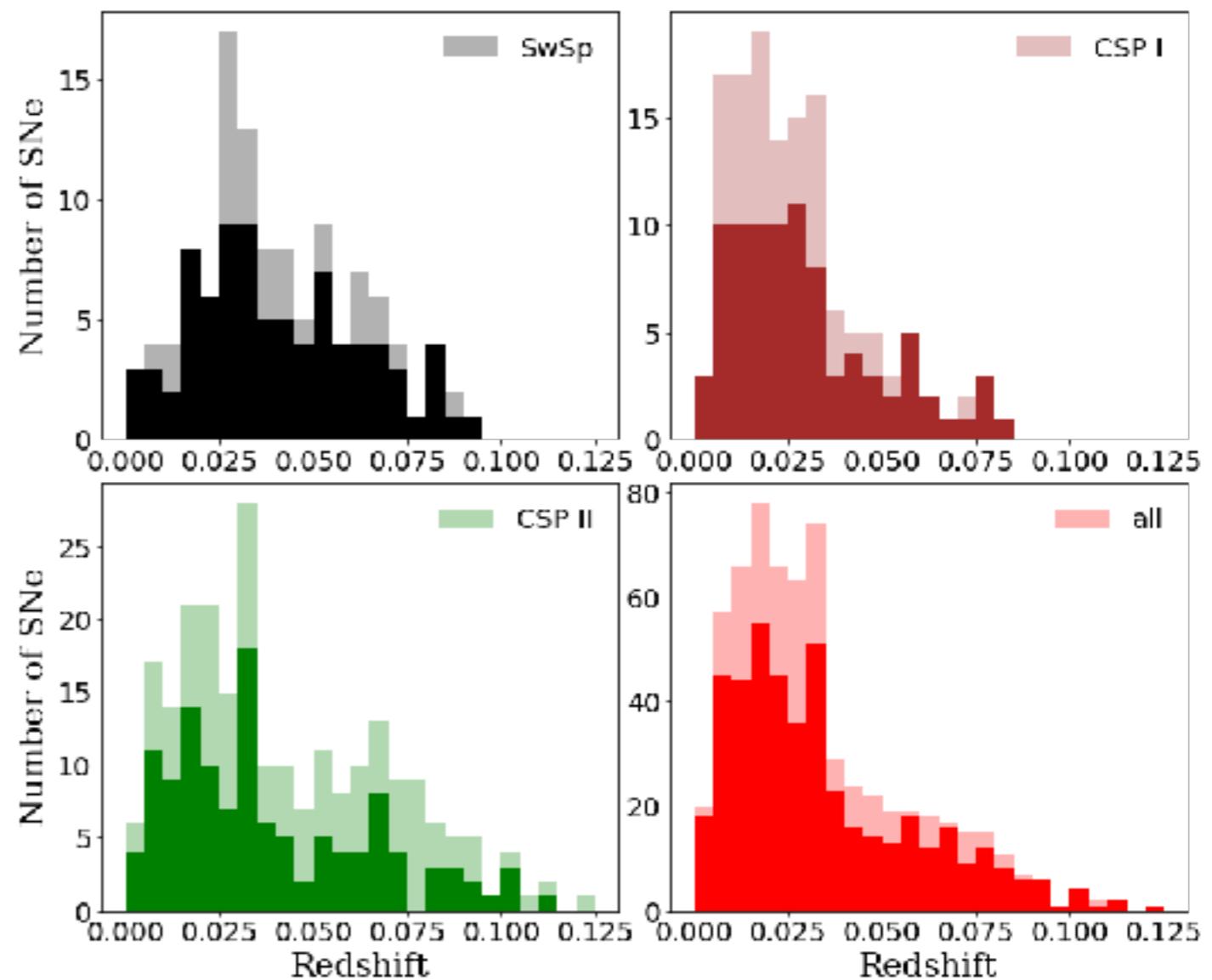


461 environments so far
OP or/and NIR

83/114 from SwSp

87/133 from CSP I

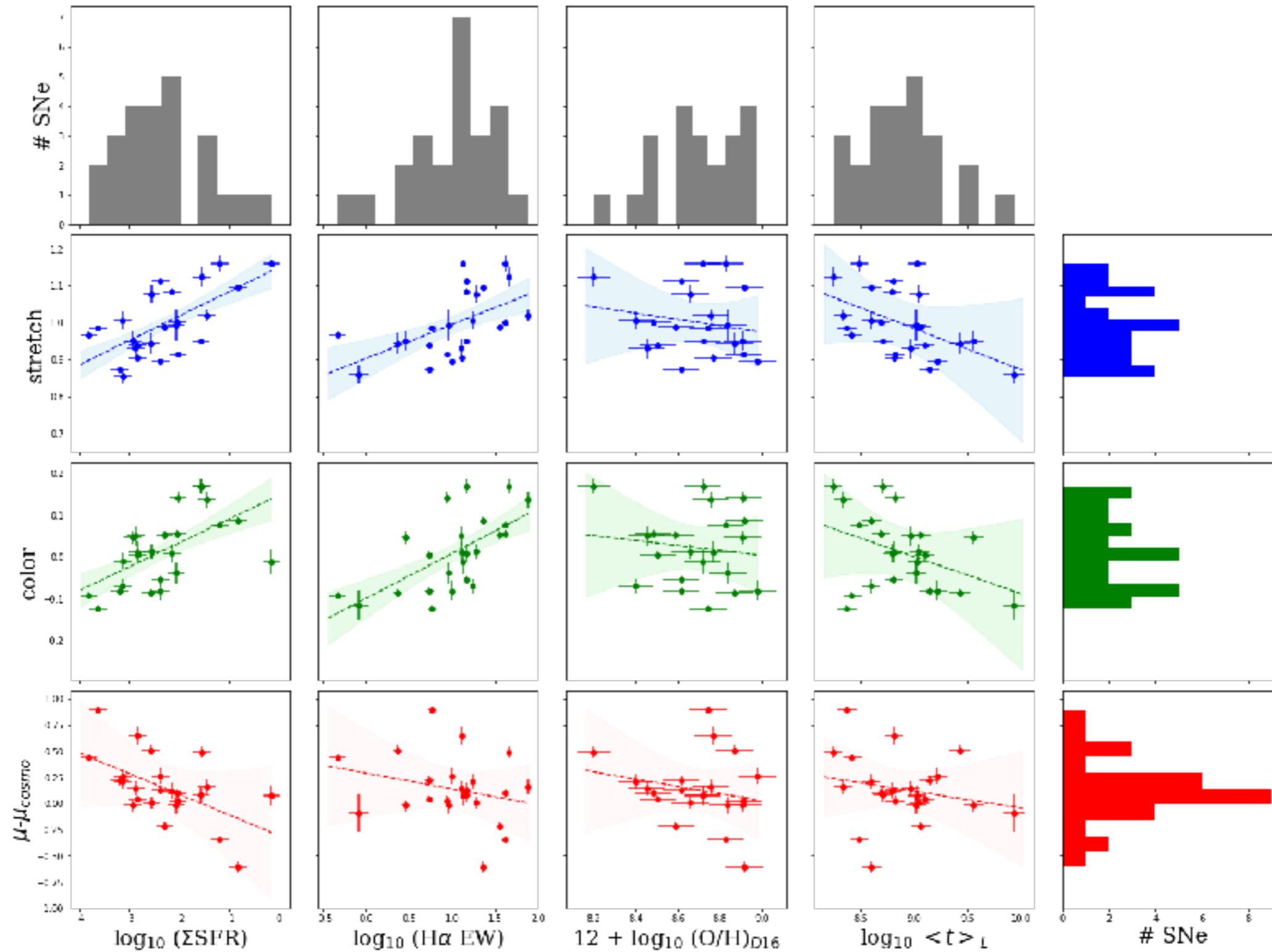
125/235 from CSP II



Currently working on SNII environments but...

Preliminary results: 29 objects in PISCO (including 7 CSP I and 4 CSP II)

After LC cuts



S_{BV} parameter

B

V

u

g

r

i

J

K

