Exploring the dust properties in galaxies at z~2 with SHARDS

Esther Marmol-Queralto & Ignacio Ferreras
P. Perez-Gonzalez, A. Cava, R.J. McLure + SHARDS team

Project 31 -merged with project 6

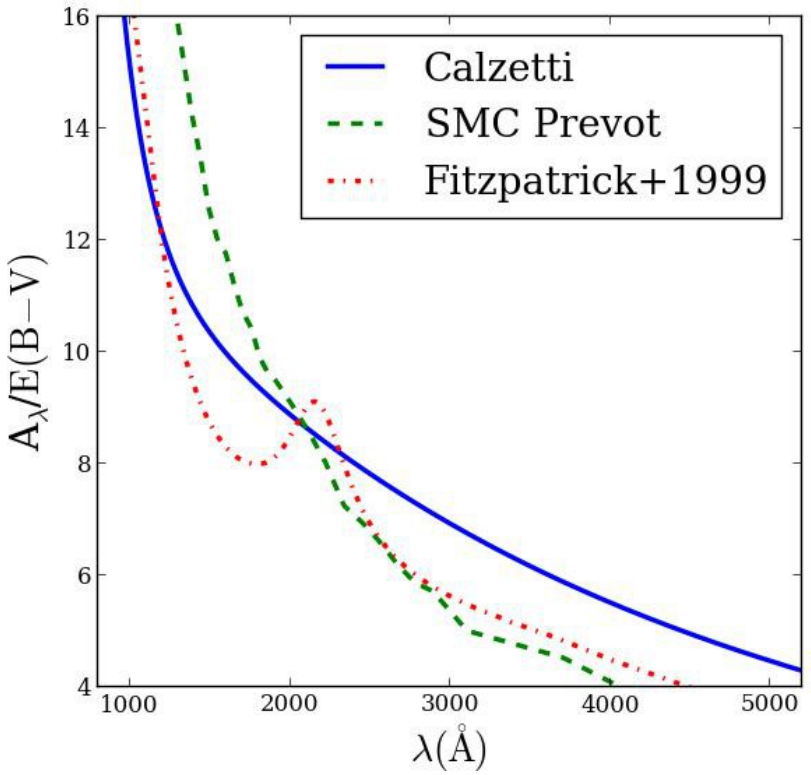
2nd SHARDS Team Meeting, Madrid

Motivation

- Attenuation law not universal

  MW and LMC > dust absorption feature ~2175 Å

  SMC and starburst galaxies > no bump



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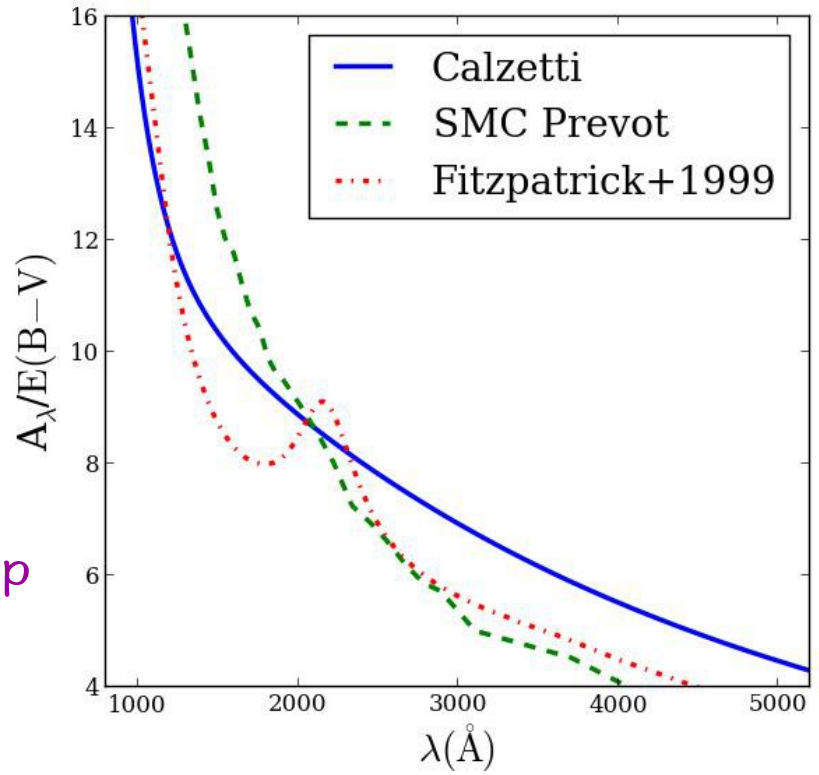


Nearby universe:

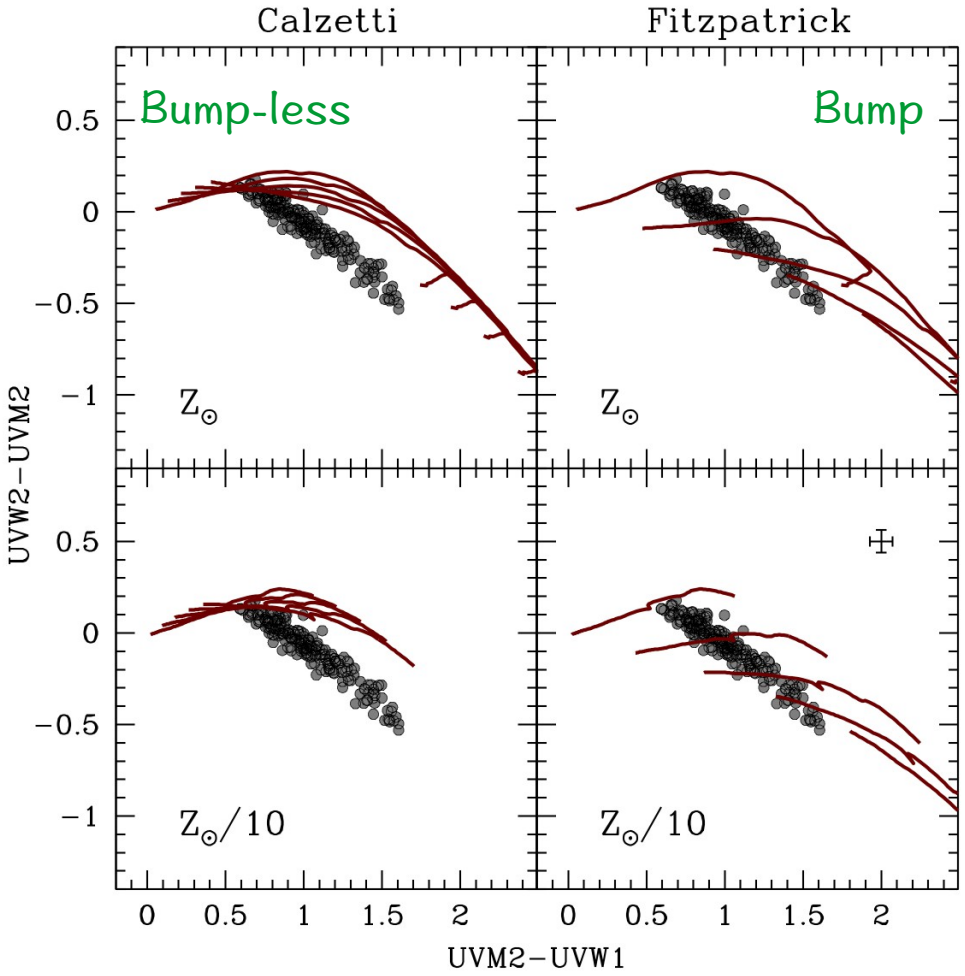
Wijensinghe+2011 with GALEX: no bump

Conroy+2010 with GALEX+SDSS on disks: bump

Wild+2011 from SED analysis: bump

Constraining the dust attenuation law with NUV+optical (restframe) photometry: M82

Hutton, Ferreras+2014



- Swift/UVOT data for M82 around the 2175 Å bump
- BC03 models

>>> A (bump-less) Calzetti law is ruled out.

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- Attenuation includes dust geometry and radiative transfer effects, with may in part explain the observed differences
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- Also it reflects differences in the dust composition
- UV bump may influence the measurement of the UV β slope, and hence the dust corrections made through the Meurer relation

A more generic attenuation law

Conroy, Schiminovich, Blanton 2010-CSB2010

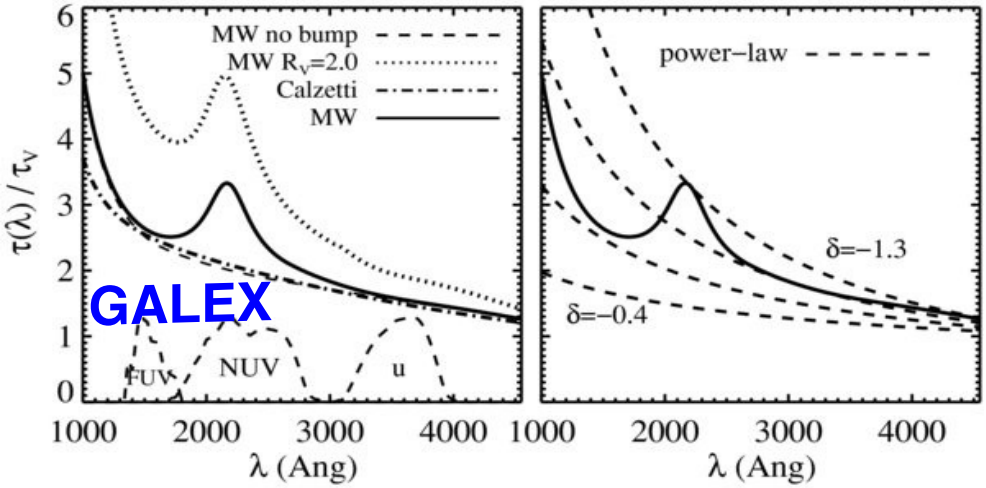
Variable NUV bump strength B

Total-to-selective extinction ratio Rv=Av/E(B-V)

B –strength of the bump

B=1 represents MW

δ – slope of the attenuation law



Rv=Av/E(B-V)

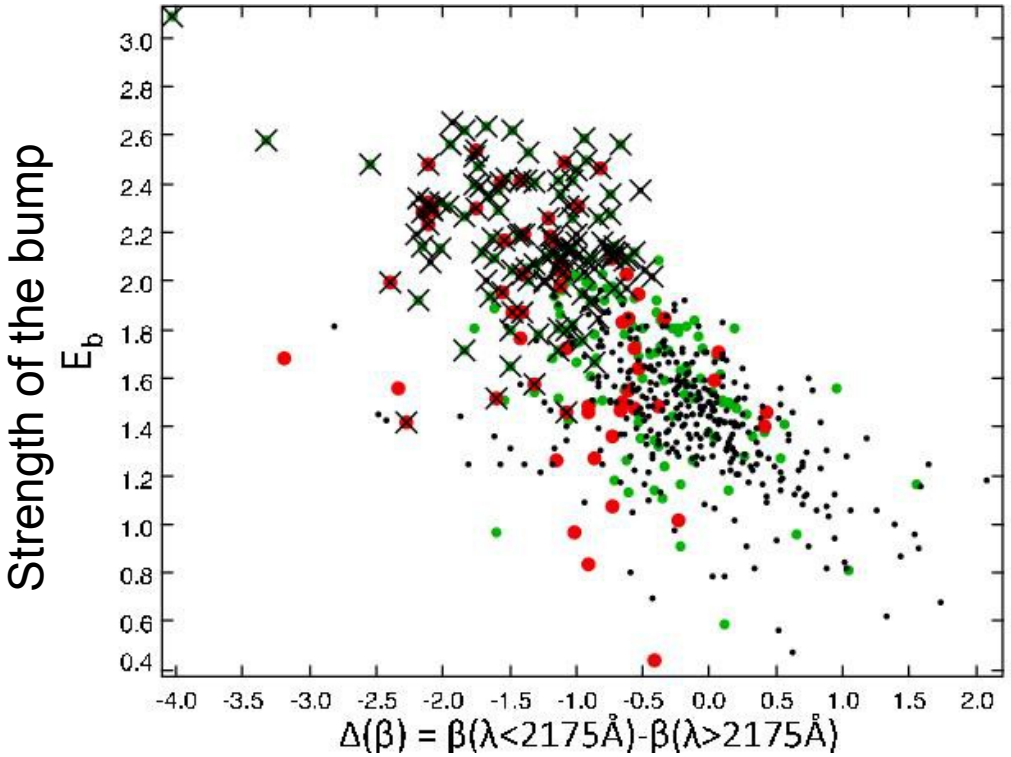
depends of the composition of the dust grains

- Rv > 3.1 –bigger than in MW
- Rv < 3.1 –smaller than in MW

Does the dust attenuation law vary at z>0?

Buat+2012
MUSYC photometry
0.95 < z < 2.2

- 20% of galaxies with detected bump, 90% of them with z<1.5
- The global amount of dust attenuation increases with mass and decreases with UV luminosity
- The mean values of B and δ are similar to LMC supershell

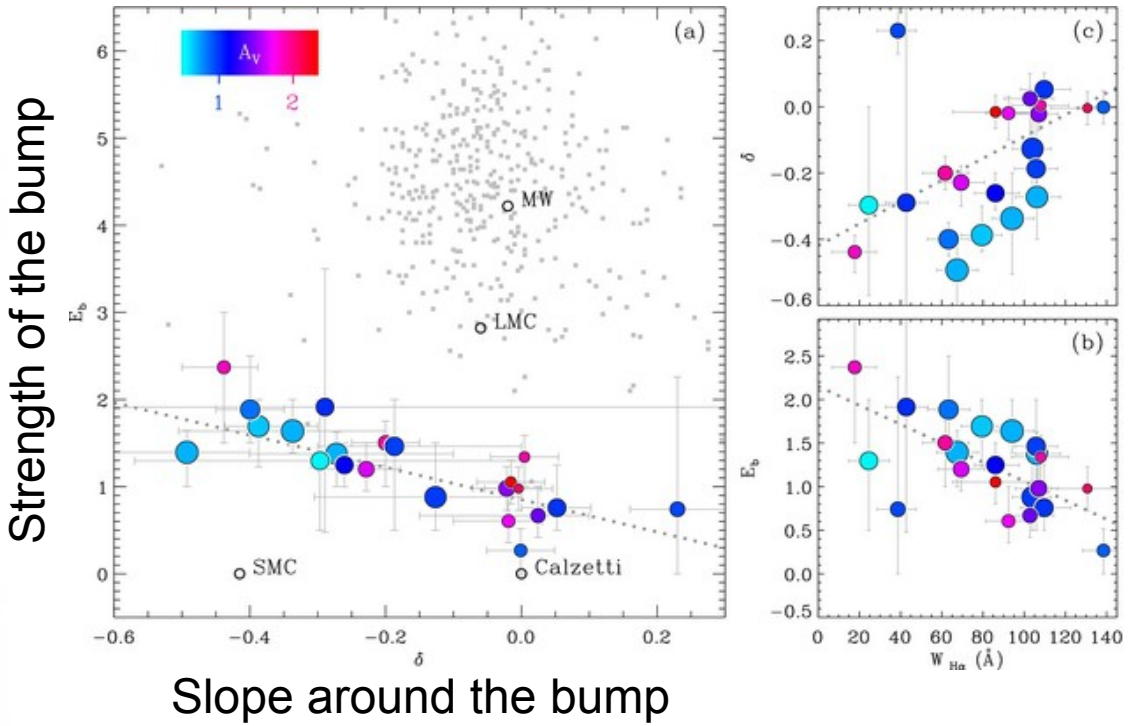


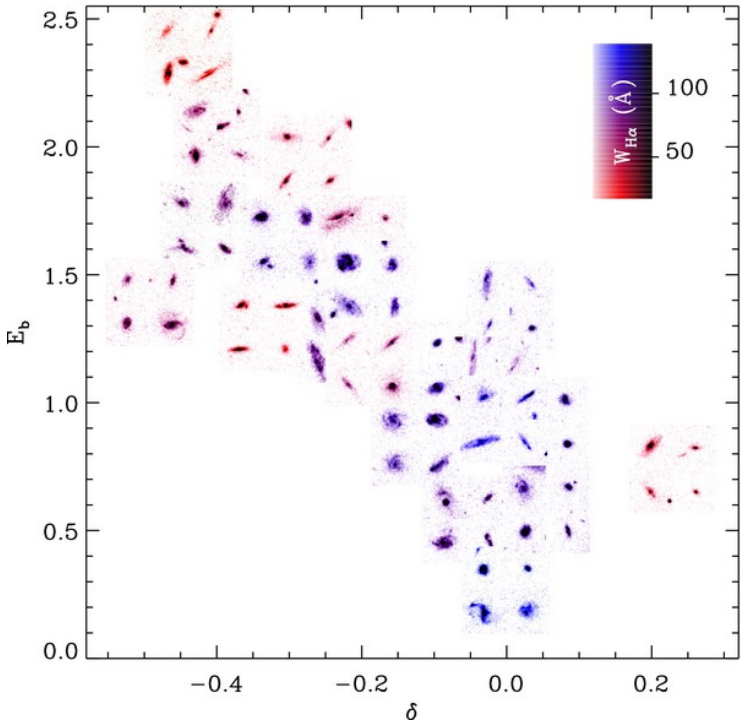
Change of the slope around 2175 Å

Does the dust attenuation law vary with the galaxy type?

Kriek & Conroy 2013
NEWFIRM photometry
0.5 < z < 2.0

Stacking SEDs of same spectral type





SED types with steeper attenuation curves have stronger UV bumps, while shallower attenuation curves go together with weaker UV bumps.

WARNING: for the Calzetti law, the dust content and sSFR could be significantly overestimated. Stellar mass are more robust, and are only slightly underestimated.

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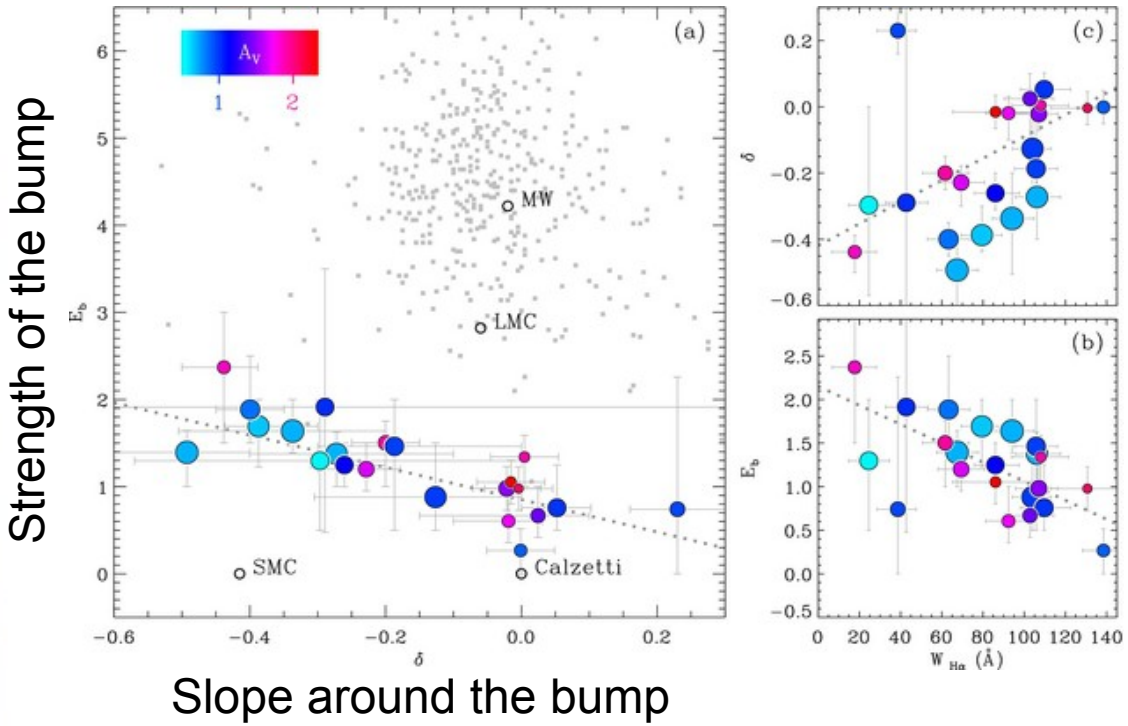

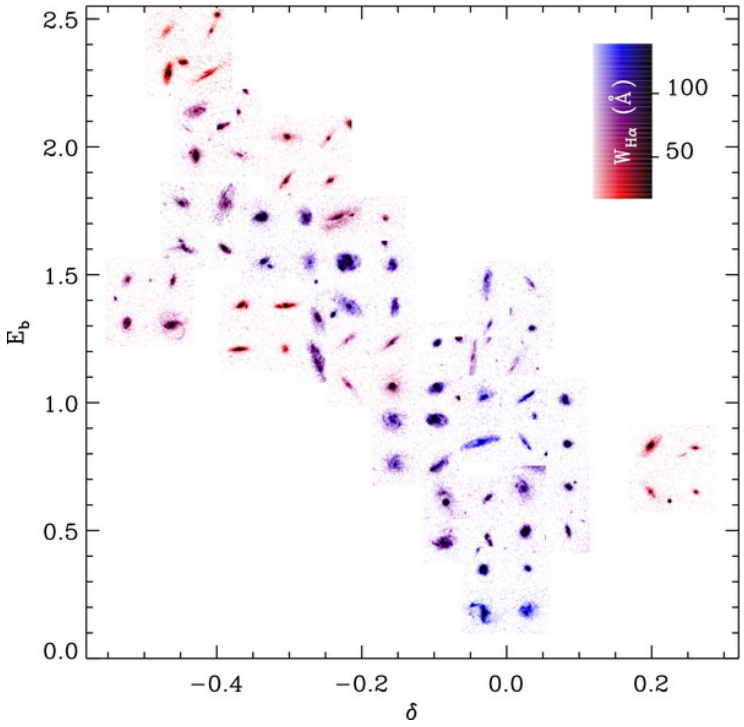

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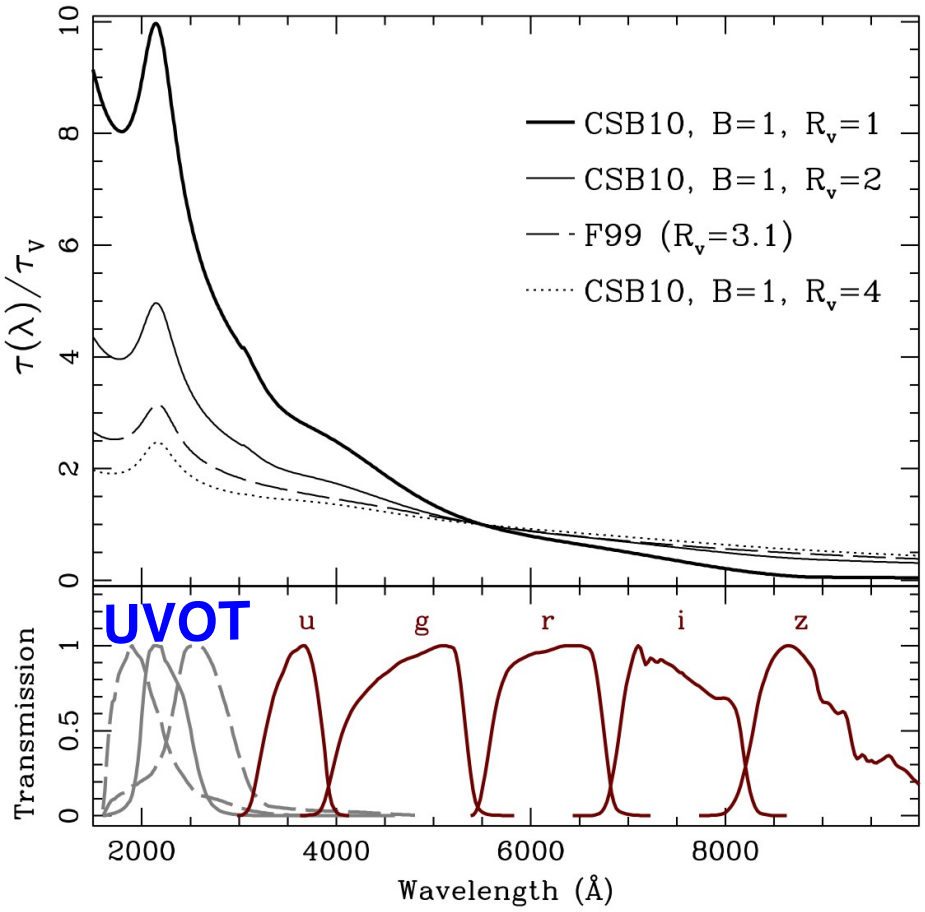
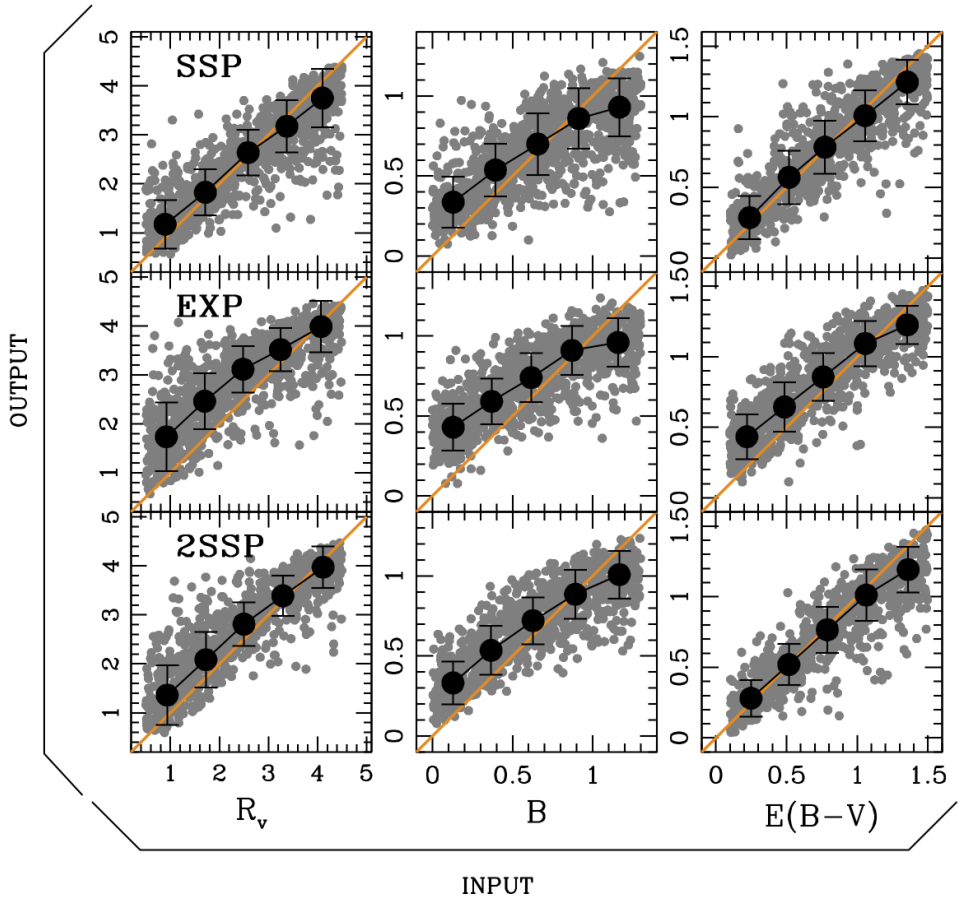
Swift/UVOT+SDSS photometry

Detailed study of M82



A proof of concept



Set of simulated populations of different SFHs (SSP, EXP: tau models, 2SSP) > it is possible to recover B and Rv

With SHARDS we will probe the NUV bump region with more data points (at 1.5<z<2.0), and the NIR filters will constrain Rv.

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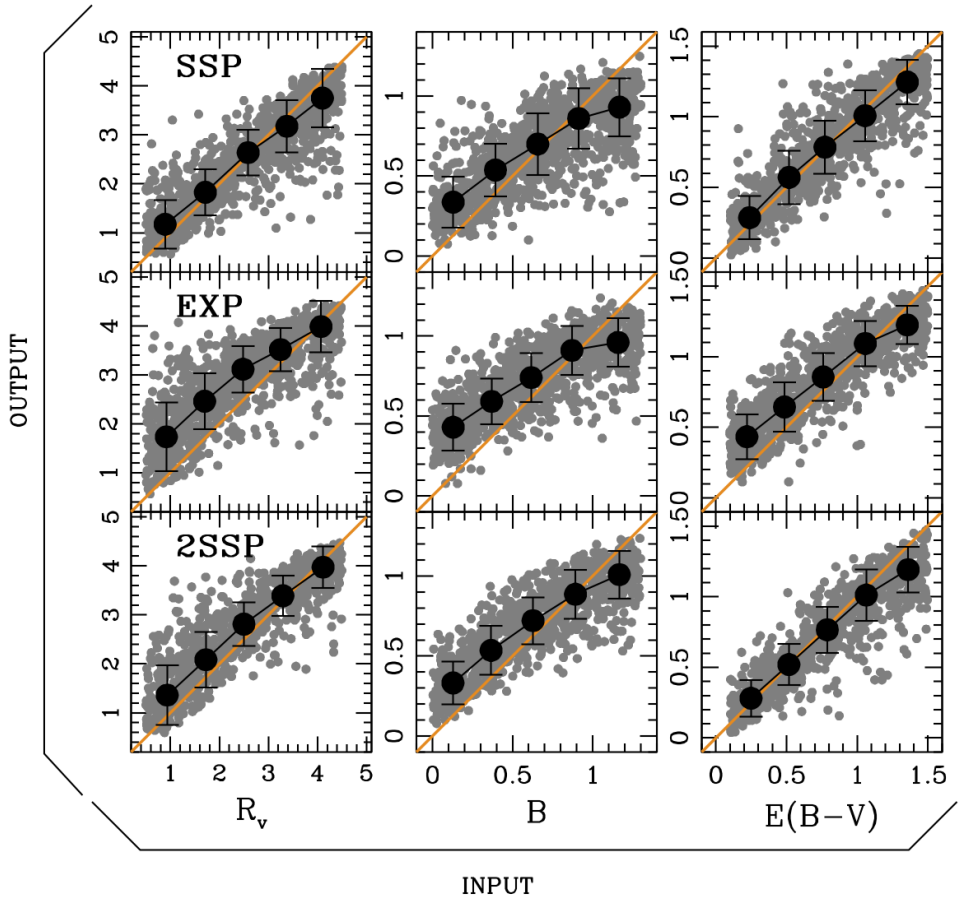

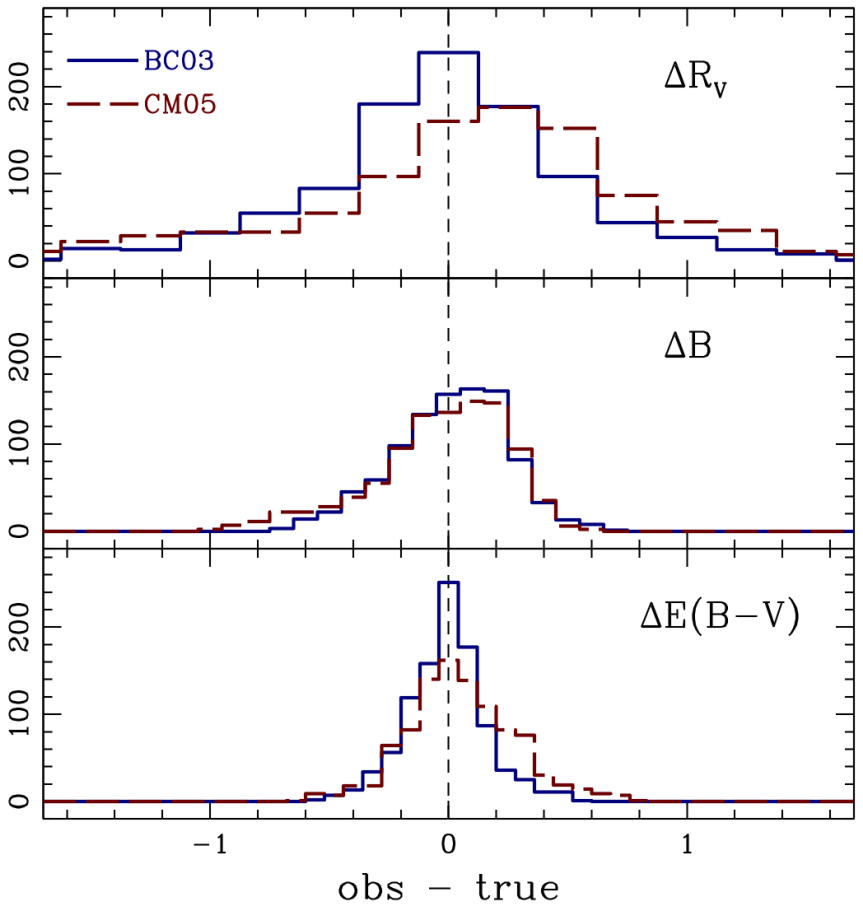

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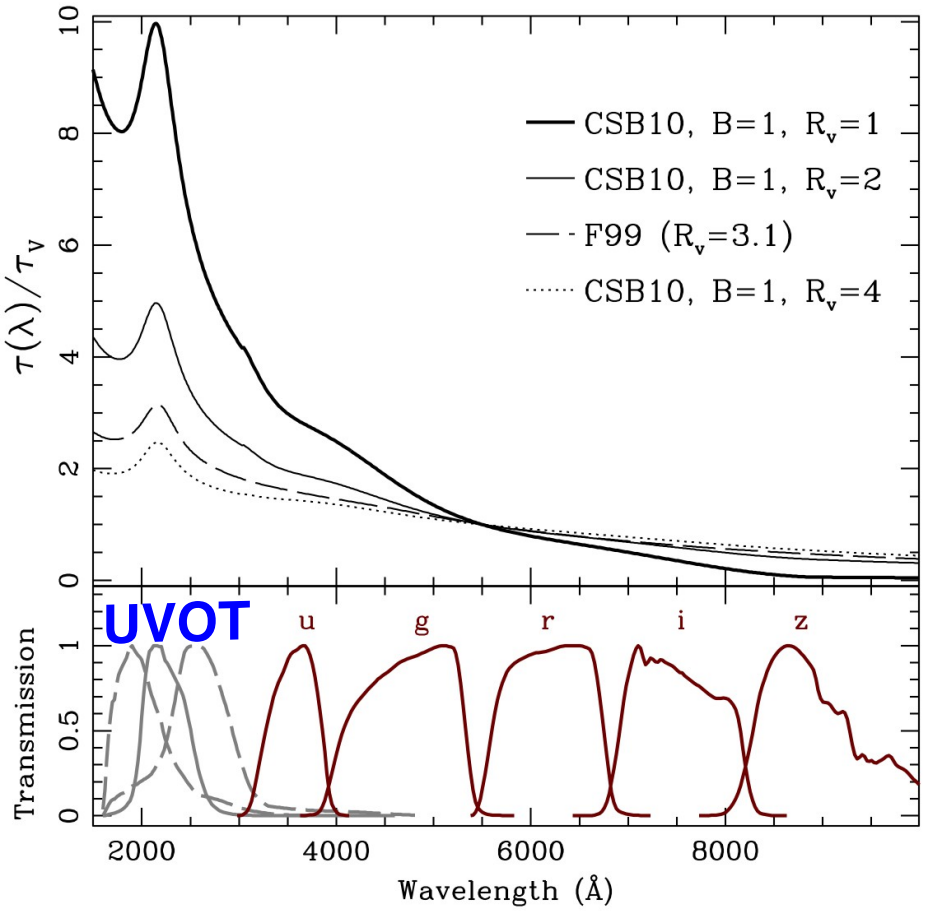
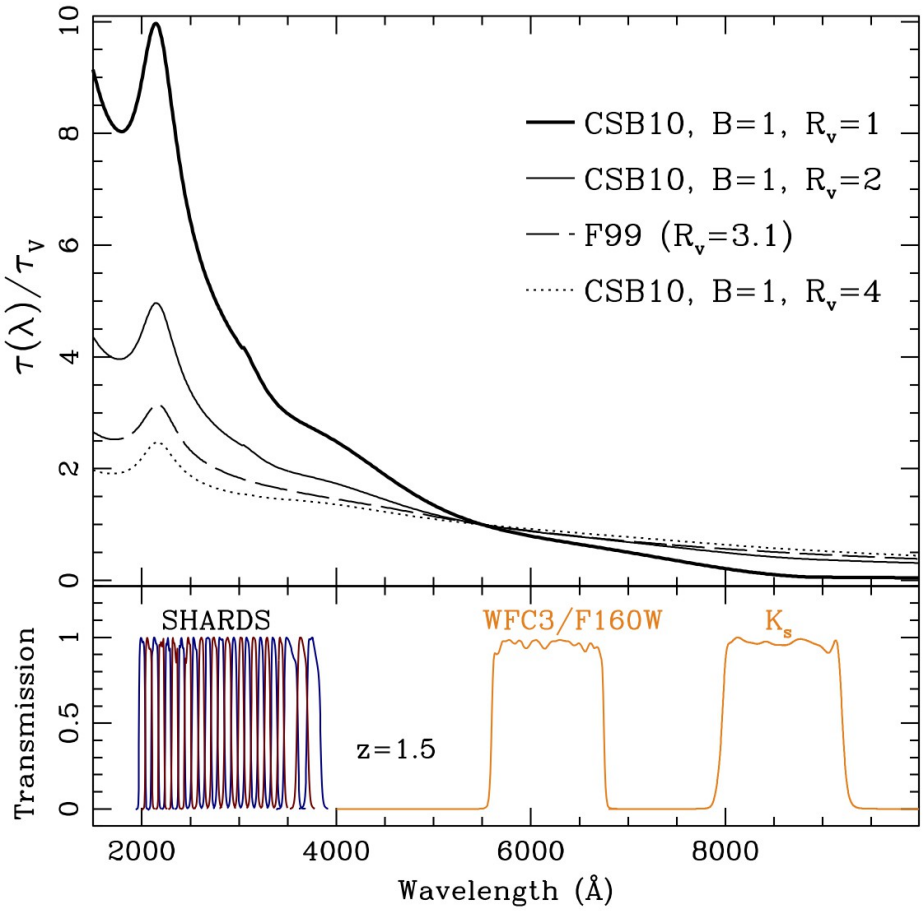




Project with SHARDS

SF galaxies
1.5 < z < 2.5
Morphology

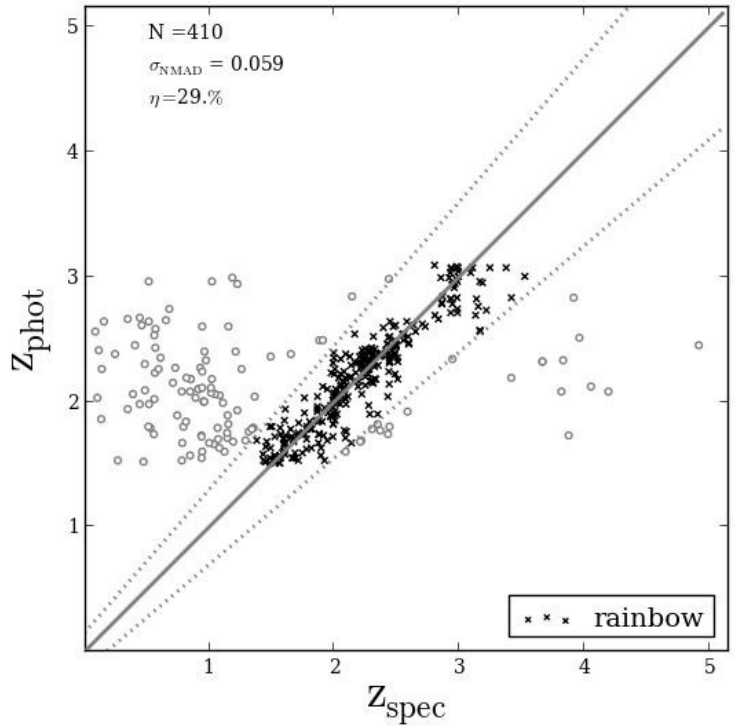
>> 8272 initially selected at 1.5 < z_{phot} < 2.5

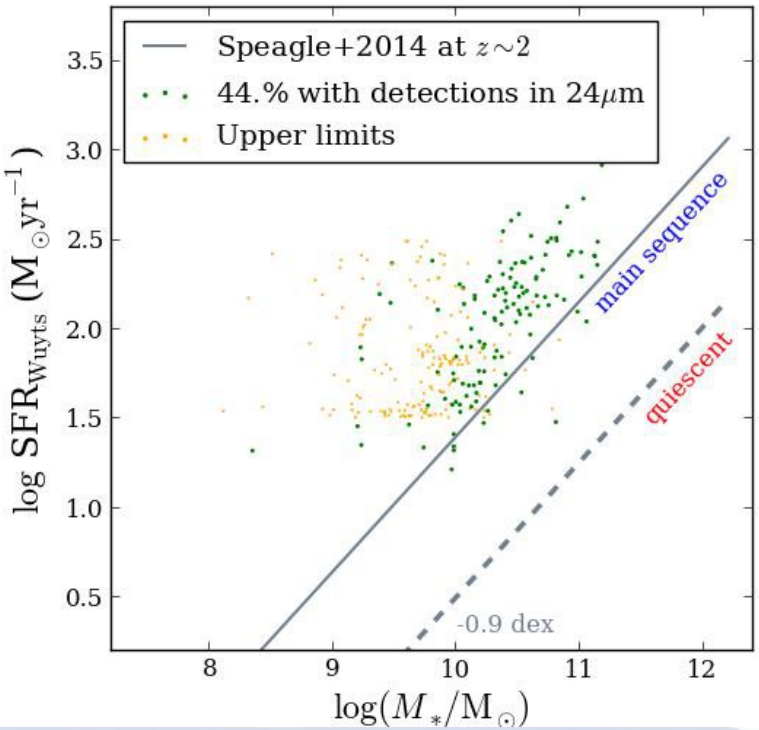
>> 2434 galaxies with good photometry and **galfit** parameters

>> 410 of those galaxies with z_{spec} -rainbow+candels- (16 %)

>> 291 SF galaxies fulfilling all the criteria (11 %)

>> Exploit SHARDS data + ancillary data (IR)

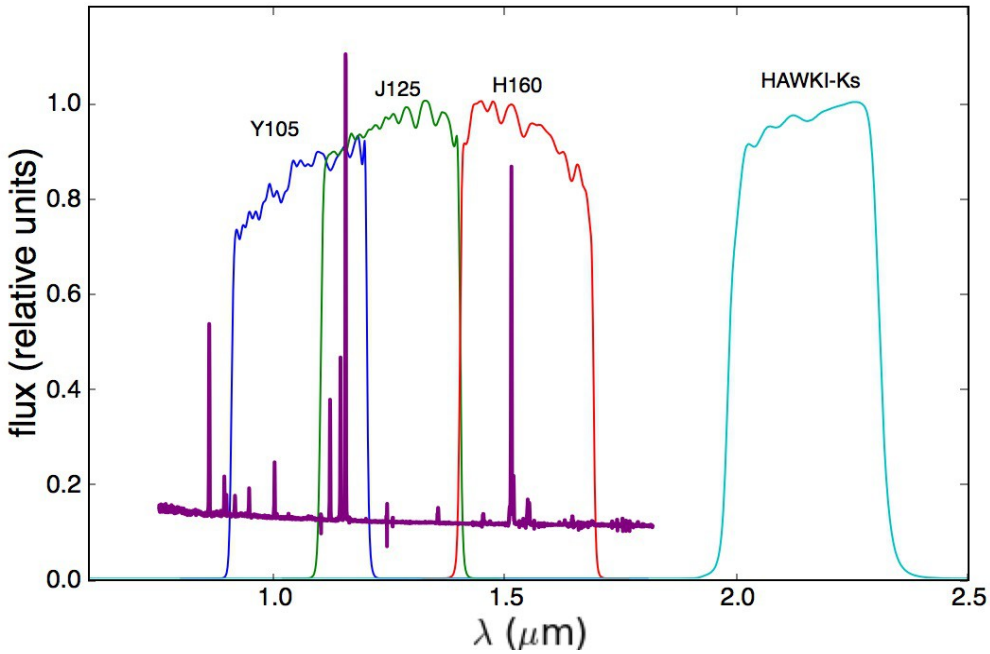




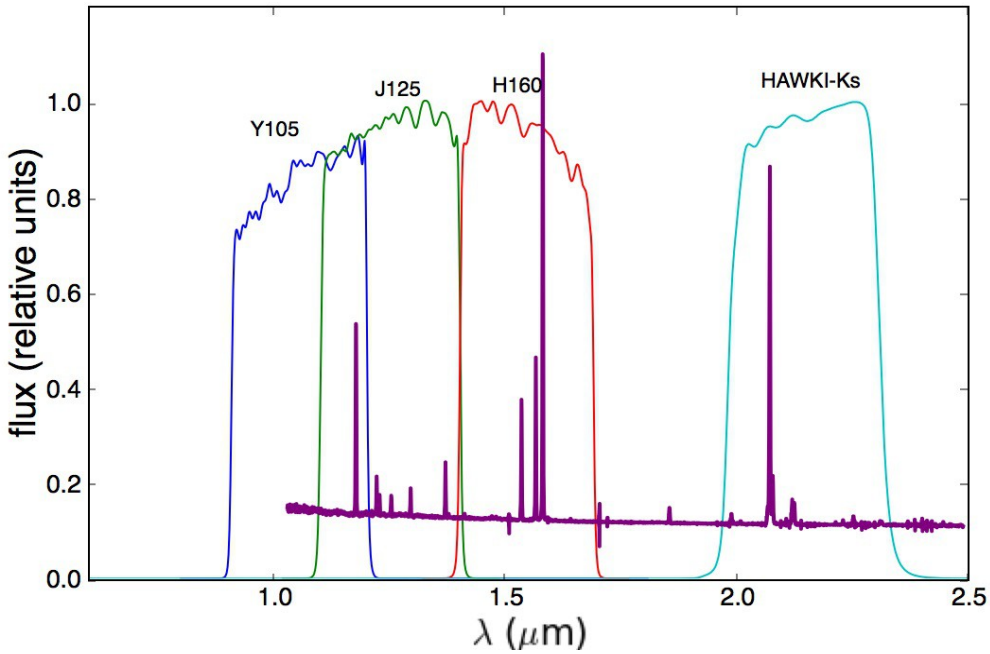
Nebular emission in high-z galaxies: results from the photometry

Esther Marmol-Queralto
Ross McLure & Fergus Cullen

Idea


Y105
J125
H160
HAWKI-Ks
flux (relative units)
0.0
0.2
0.4
0.6
0.8
1.0
1.0
1.5
2.0
2.5
λ (μm)

Idea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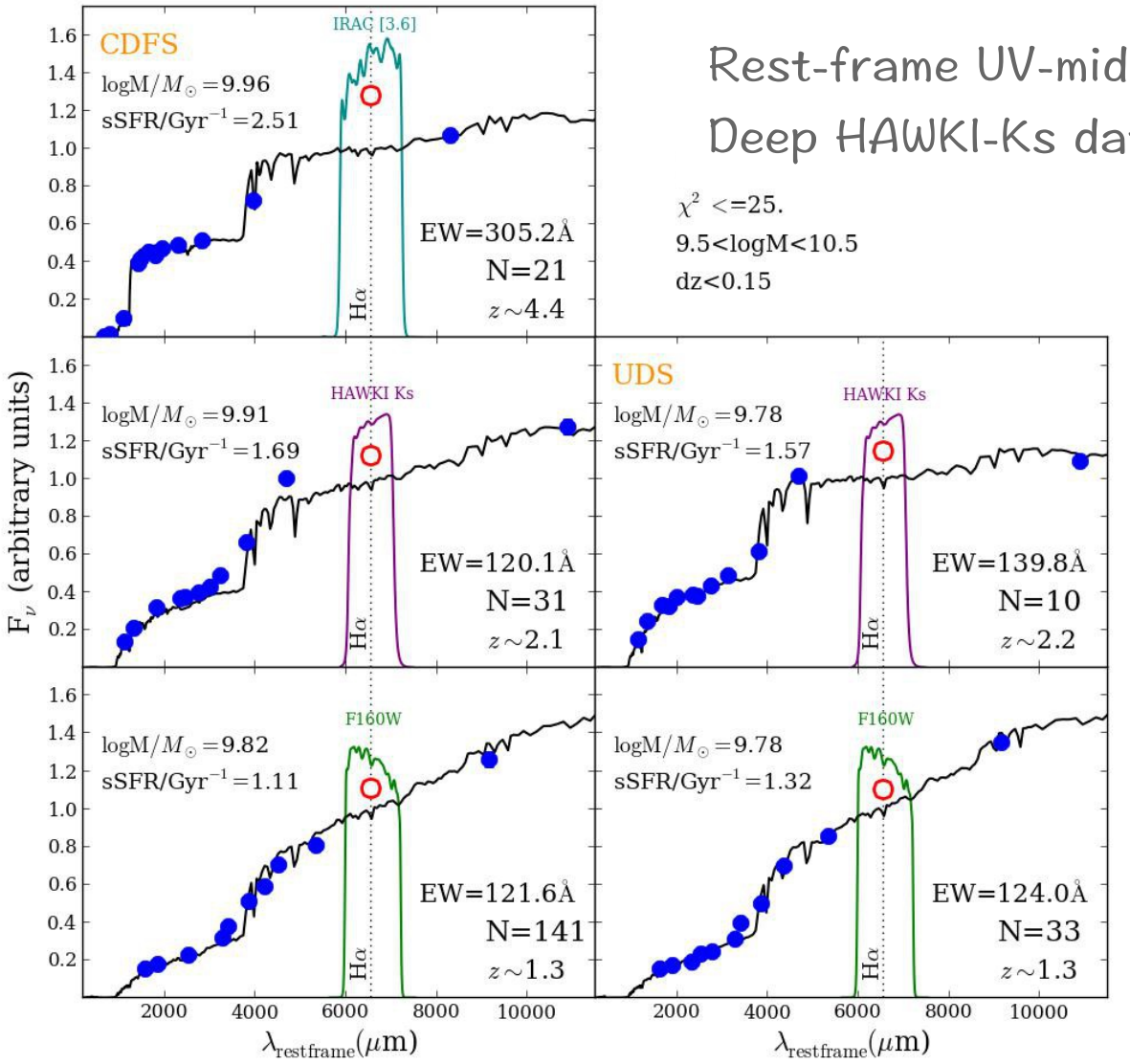
Photometric data: CANDELS

GOODS-S: Guo+2013
UDS: Galametz+2013



χ^2 <=25.
9.5<logM<10.5
dz<0.15

Rest-frame UV-midIR (Spitzer/IRAC 3.6 and 4.5 μm)
Deep HAWKI-Ks data from HUGS -Fontana+2014

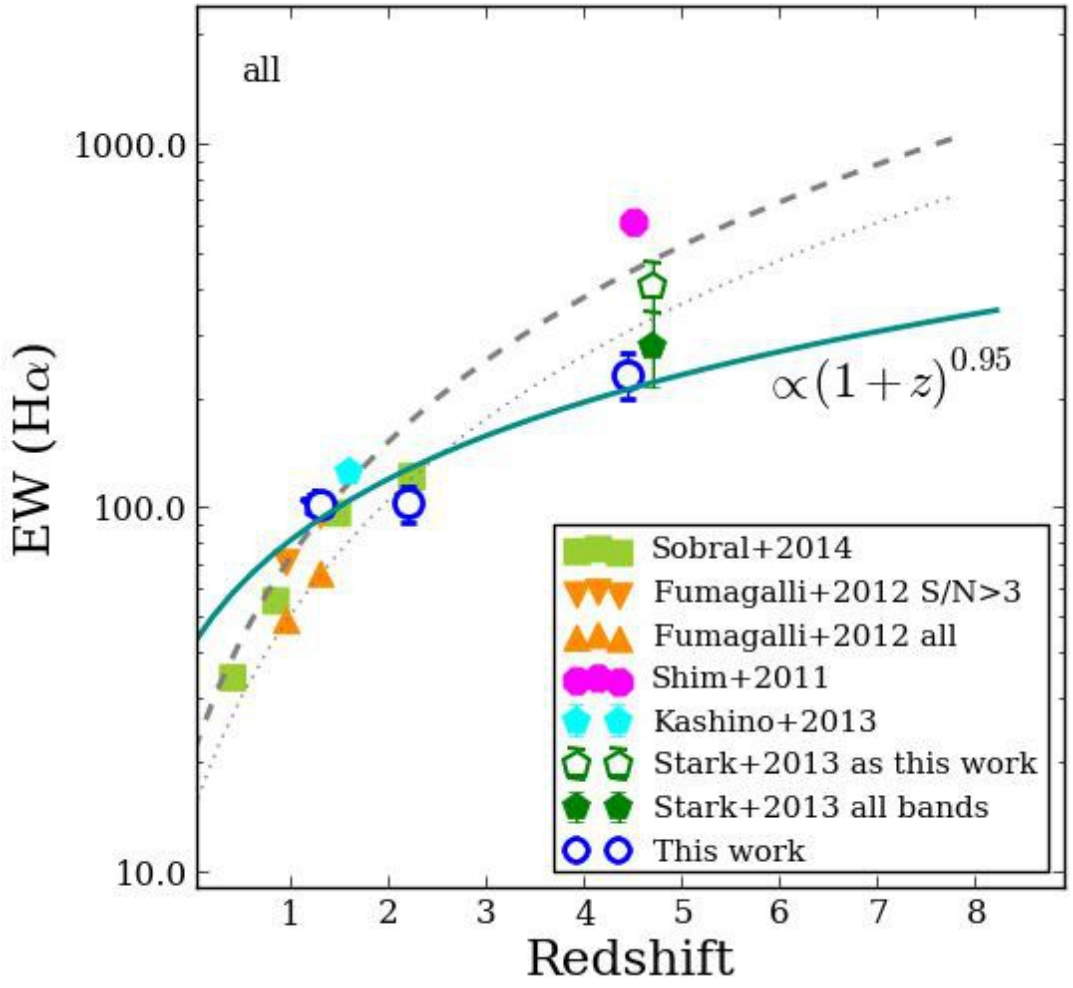
SED fitting with LePhare code

Bruzual & Charlot2003 models
Chabrier IMF
Exponential declining τ SFH
Solar/subsolar metallicity
Calzetti/SMC attenuation curve

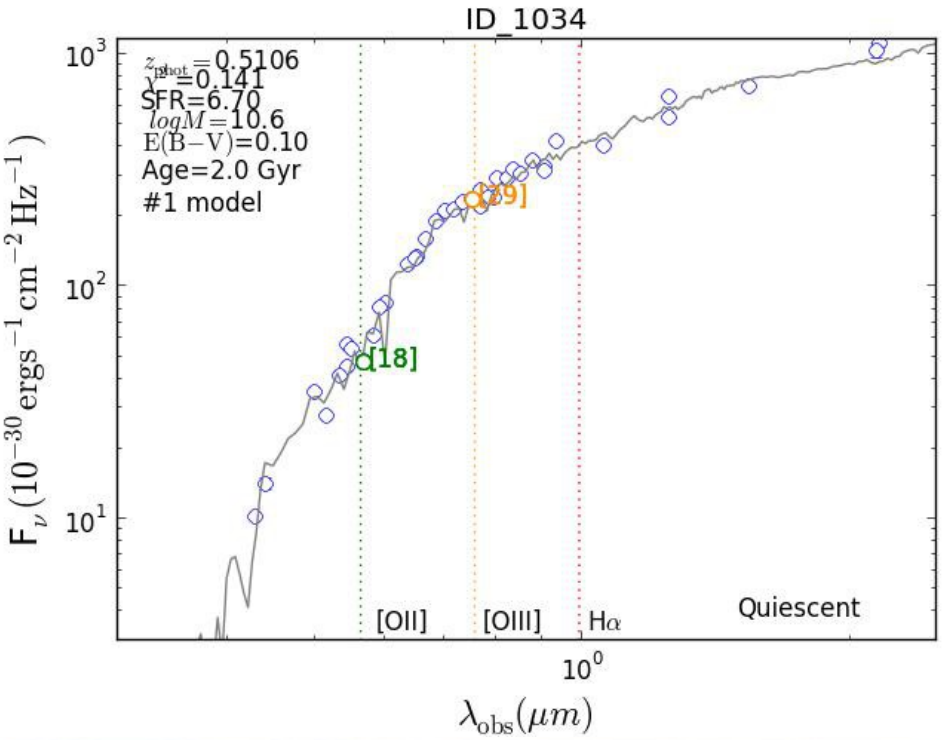
>>> secure specz

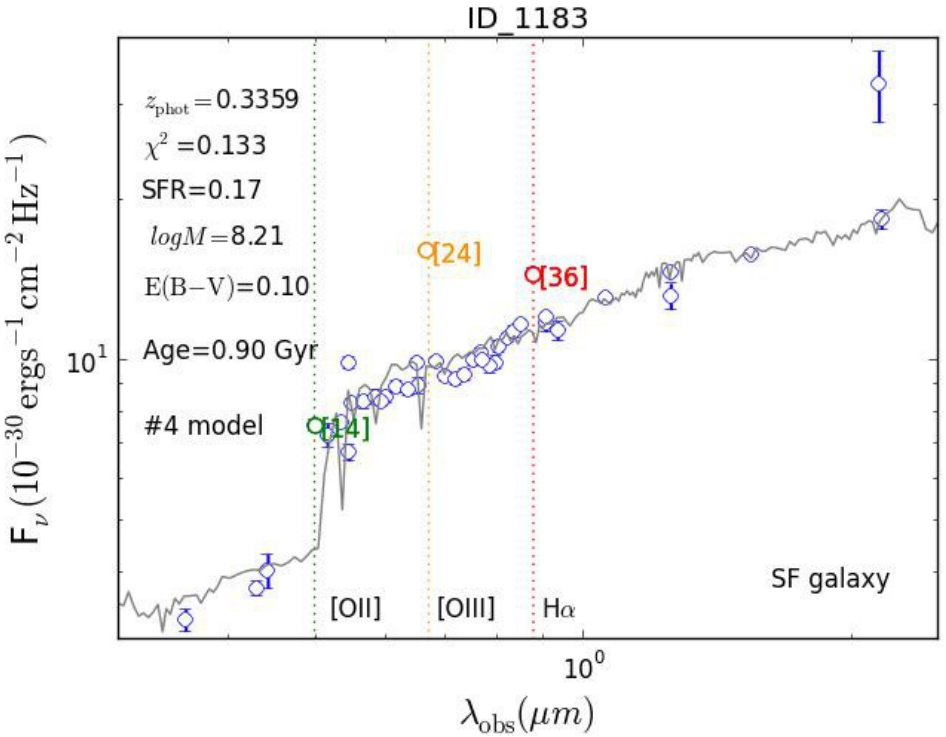
A clear flux excess is detected in the photometric bands where the nebular emission lines are expected: flux in the continuum from the SED

Evolution of EW(Hα) with redshift



Examples with SHARDS





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