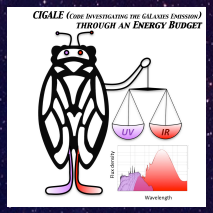


Constraining the properties of AGN host galaxies

Laure CIESLA

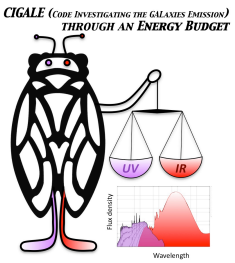
Ciesla et al. 2015, A&A 576 10

V. Charmandaris, A. Georgakakis, E. Le Floc'h, I. Georgantopoulos, G. Magdis, et al.

CIGALE team: D. Burgarella, M. Boquien, V. Buat, and Y. Roehhly

CIGALE – Code Investigating GALaxy Emission

Burgarella's poster # 32

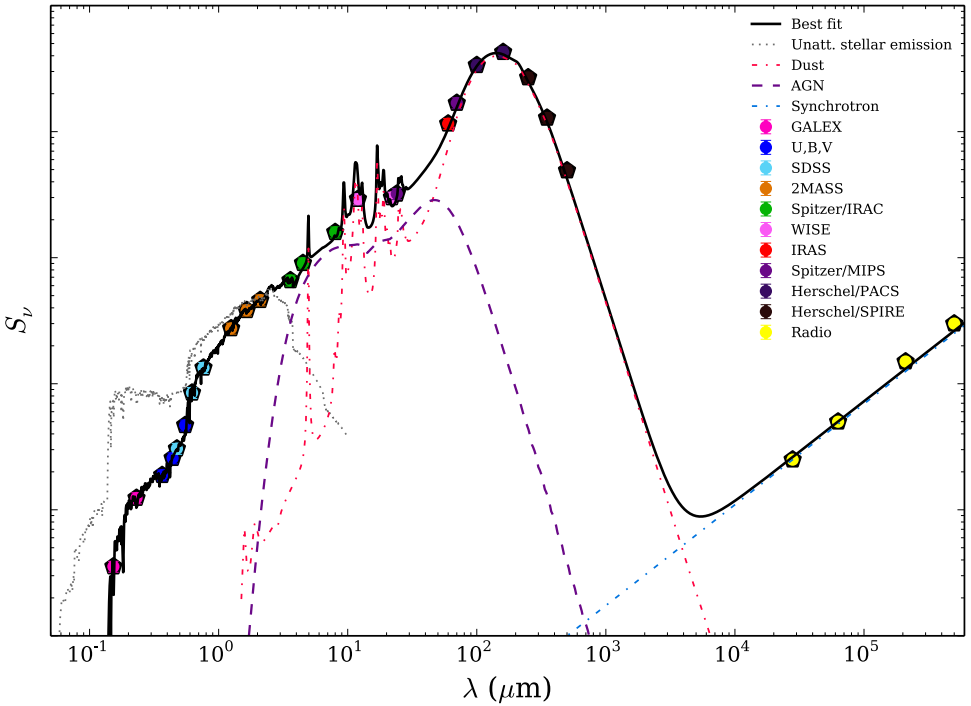


Burgarella +, in prep
Boquien +, in prep
Ciesla+15 (AGN)

public code: http://cigale.lam.fr/

SED modeling
and
SED fitting code
based on ENERGY BALANCE

Parameter analysis through
PDF analysis

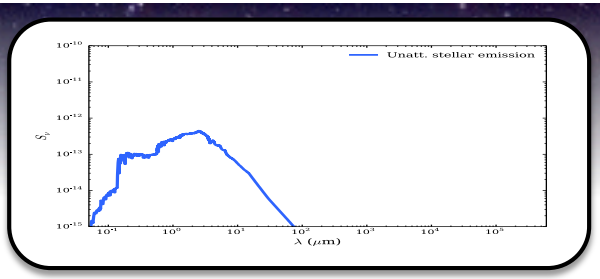


SFH:
Analytical (exp-dec, delayed, etc…)
Complex (SAM, etc…)

⊗

Stellar Populations:
Bruzual&Charlot 03
Maraston+05

→

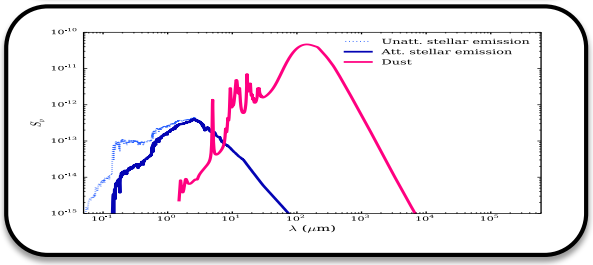


Attenuation:
Calzetti law, power law

↷

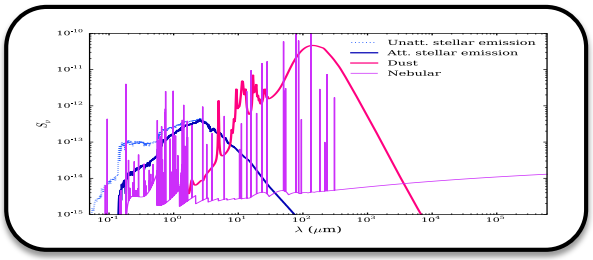
Dust emission:
Dale+14,
Draine&Li 07 + updates
Casey+12

→



Nebular emission:
Inoué models

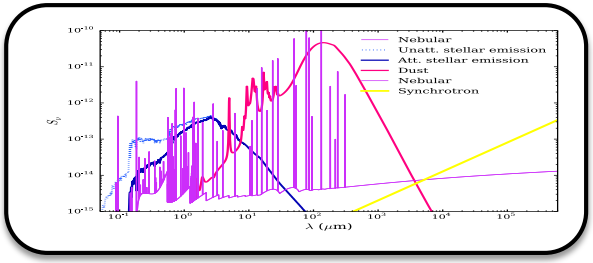
→



Analysis:
χ^2 computation + probability distribution function analysis

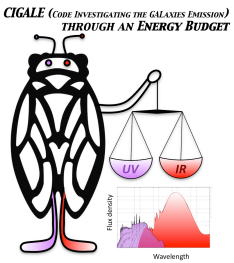
Synchrotron from SF:
FIR-radio correlation

→



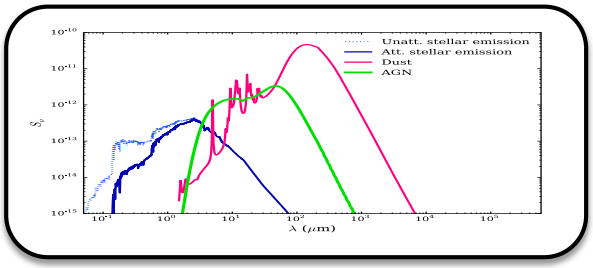
Boquien +, in prep
Burgarella+, in prep
Ciesla+15 (AGN)

CIGALE (Code Investigating the GALaxies Emission) THROUGH AN Energy Budget



AGN:
Fritz+06

→



AGNs in CIGALE

Full Library of Fritz+2006

```
[[fritz2006]]
  # Ratio of the maximum to minimum radii of the dust torus. Possible
  # values are: 10, 30, 60, 100, 150.
  r_ratio = 60.0
  # Optical depth at 9.7 microns. Possible values are: 0.1, 0.3, 0.6, 1.0,
  # 2.0, 3.0, 6.0, 10.0.
  tau = 0.1, 1.0, 6.0
  # Beta. Possible values are:-1.00, -0.75, -0.50, -0.25, 0.00.
  beta = -0.5
  # Gamma. Possible values are: 0.0, 2.0, 4.0, 6.0.
  gamma = 0.0
  # Opening angle of the dust torus. Possible values are: 20, 40, 60.
  opening_angle = 40.0
  # Angle between AGN axis and line of sight. Possible values are: 0.001,
  # 10.100, 20.100, 30.100, 40.100, 50.100, 60.100, 70.100, 80.100,
  # 89.990.
  psy = 0.001
  # AGN fraction.
  fracAGN = 0., 0.05, 0.1, 0.2, 0.3
```

CIGALE configuration file

AGNs in CIGALE

Full Library of Fritz+2006

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[[fritz2006]]
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```

CIGALE configuration file

Main parameter: $frac_{AGN}$
where $L_{AGN} = frac_{AGN} \times LIR(SF+AGN)$

Motivations

Broad Band UV to submm SED fitting widely used to derive galaxies properties of large samples

What about AGN host galaxies?

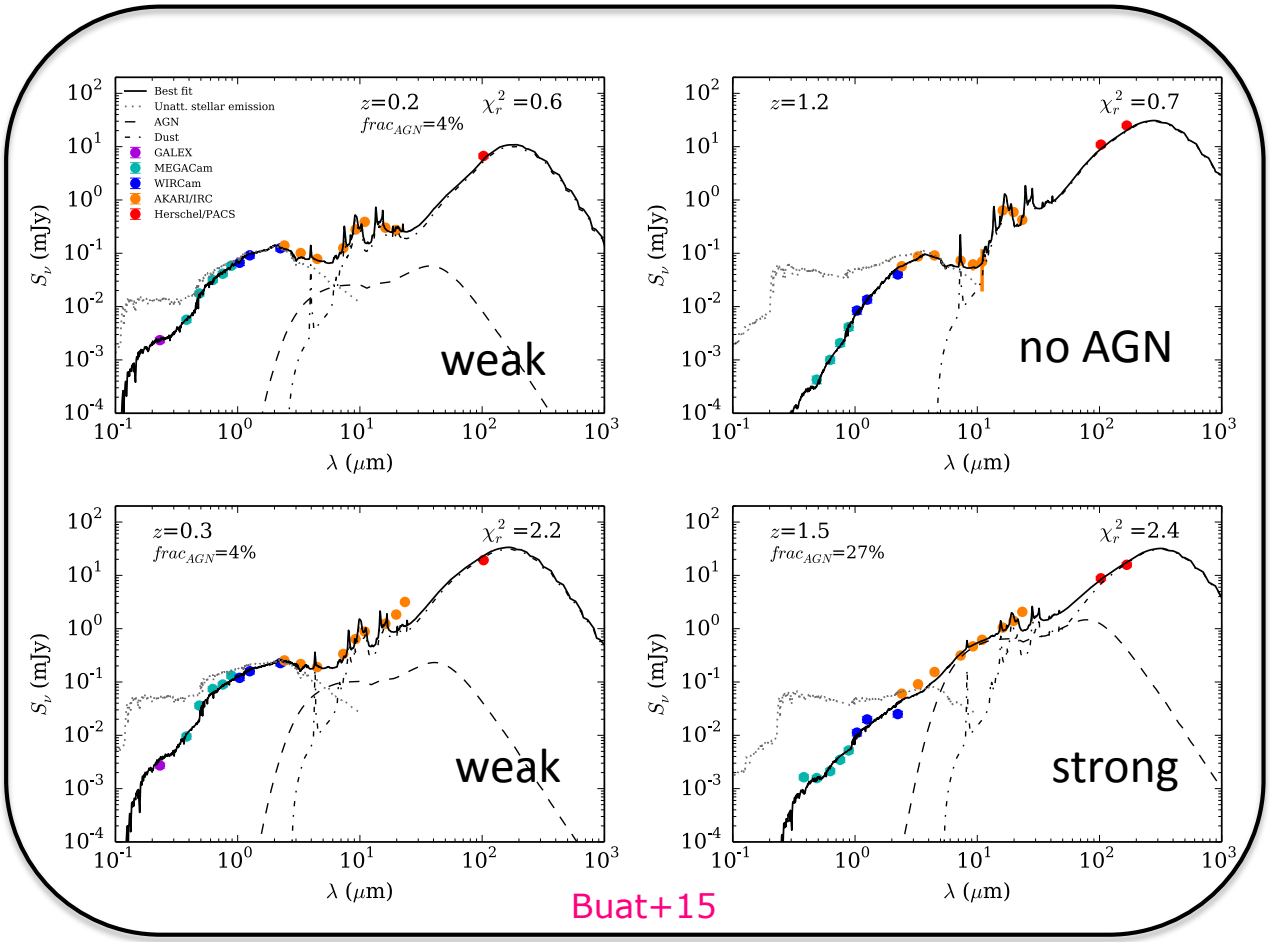
In normal SF galaxies:

- No systematic offset on M_*
- SFR well recovered as long as one IR data available

Wuyts+09, Pforr+12, Mitchell+14, Buat+14

How well can we retrieve M* and SFRs in AGN host galaxies?

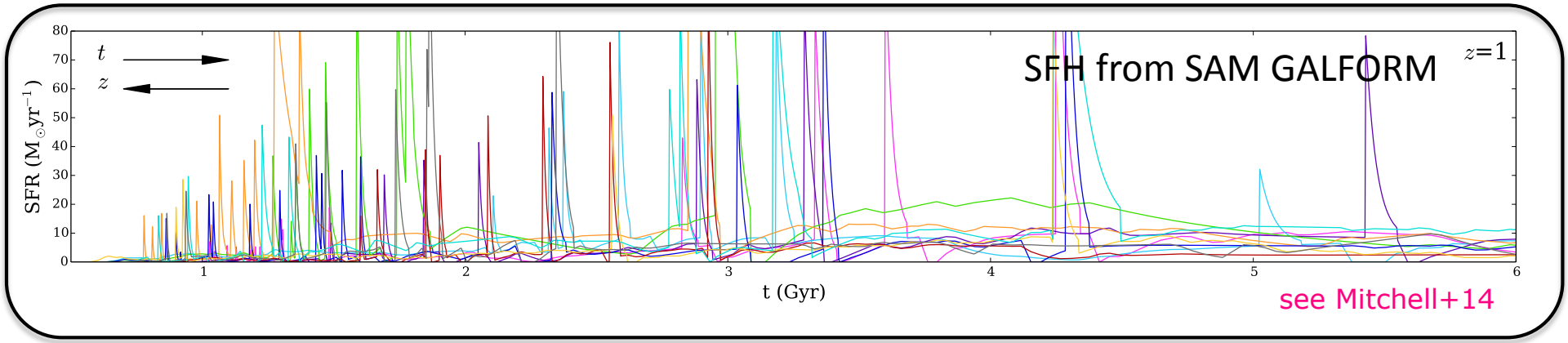
How does the AGN emission affect the SED fitting?

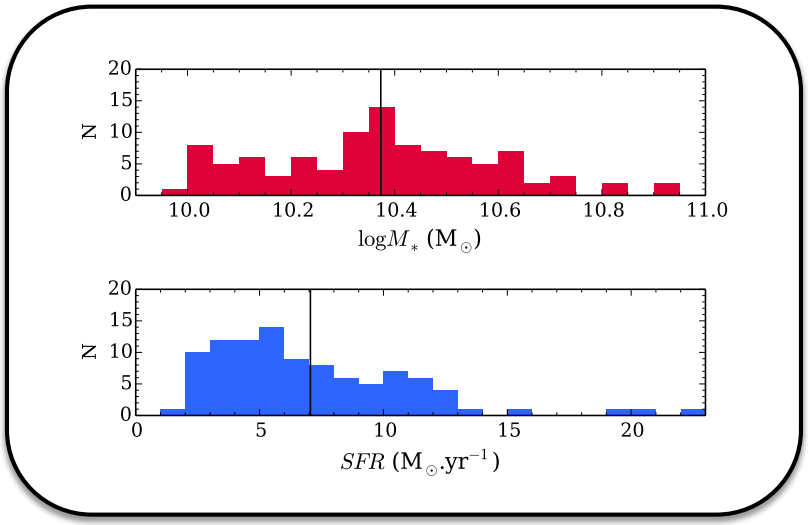


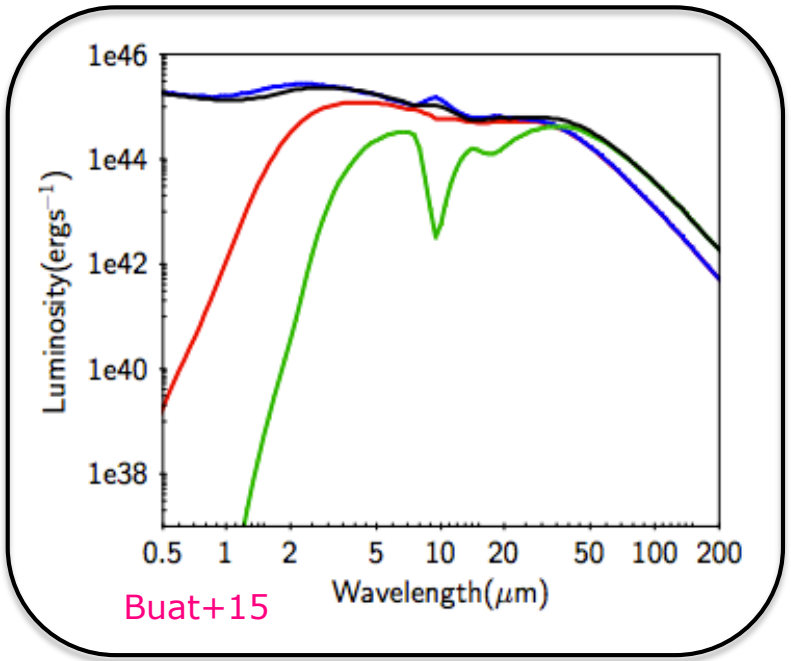
Buat+15

Creating mock SED of AGNs

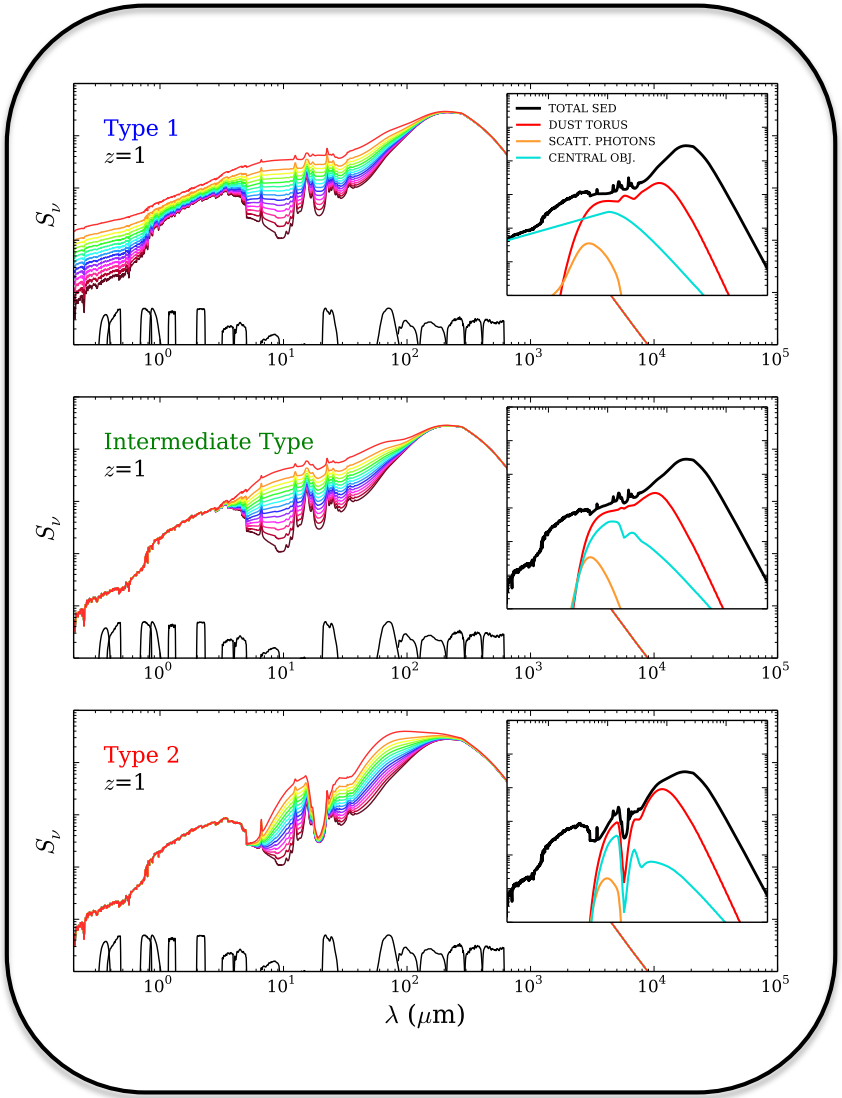
- Compute mock SEDs for which we know the REAL M*, SFR, and fracAGN
- Add an AGN emission

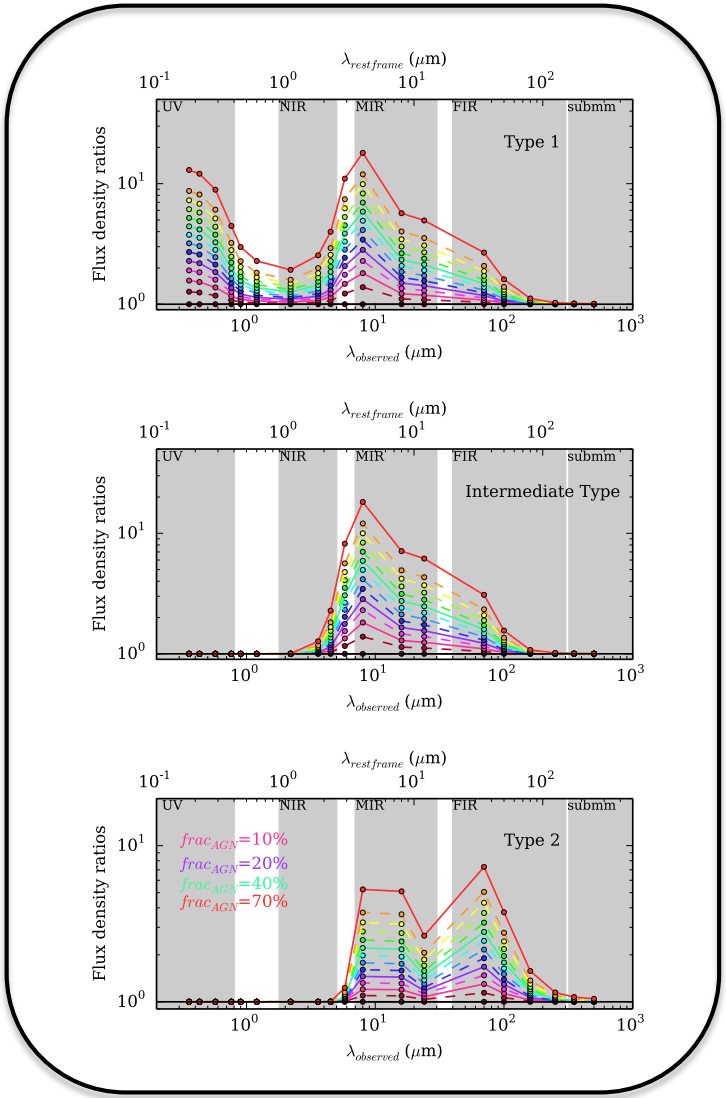






Creating mock SED of AGNs



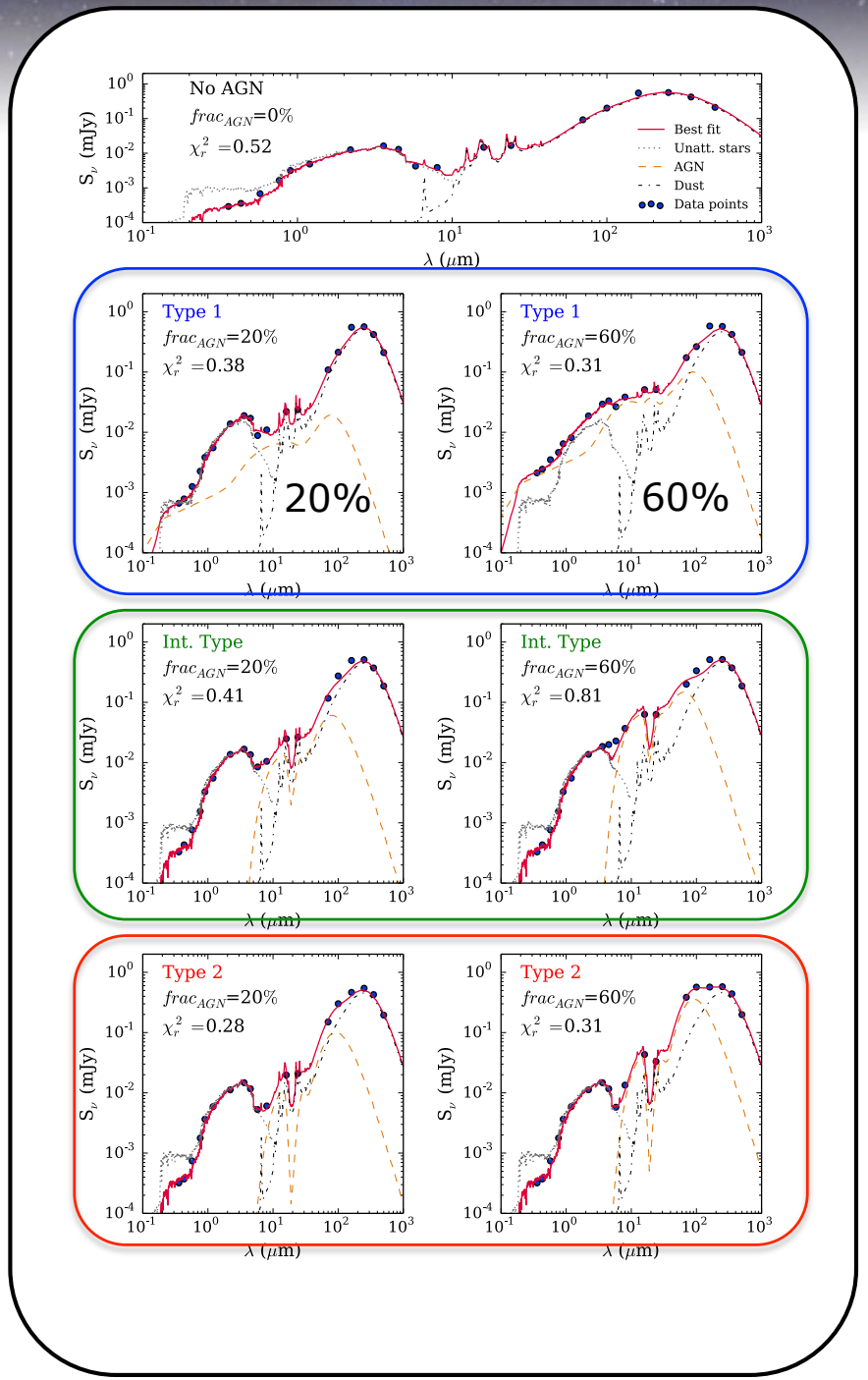


Fitting the mock SEDs of AGNs

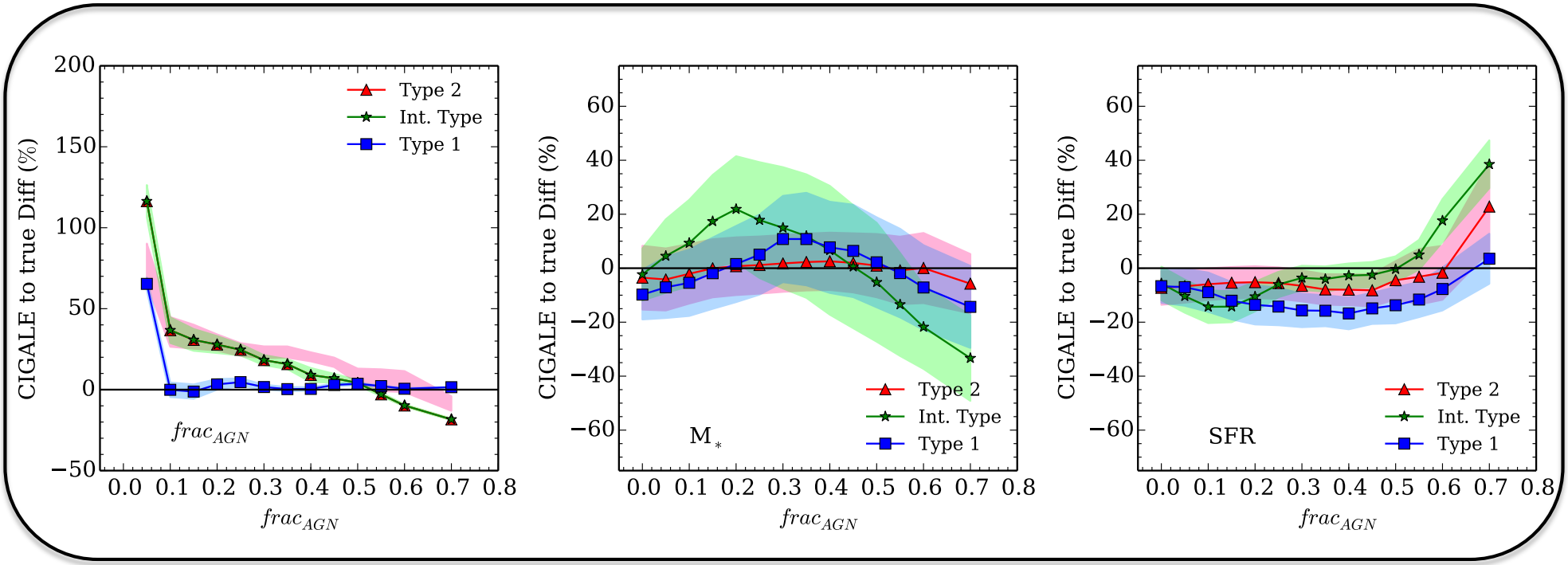
Parameters used for **mocks SEDS**

$\neq$

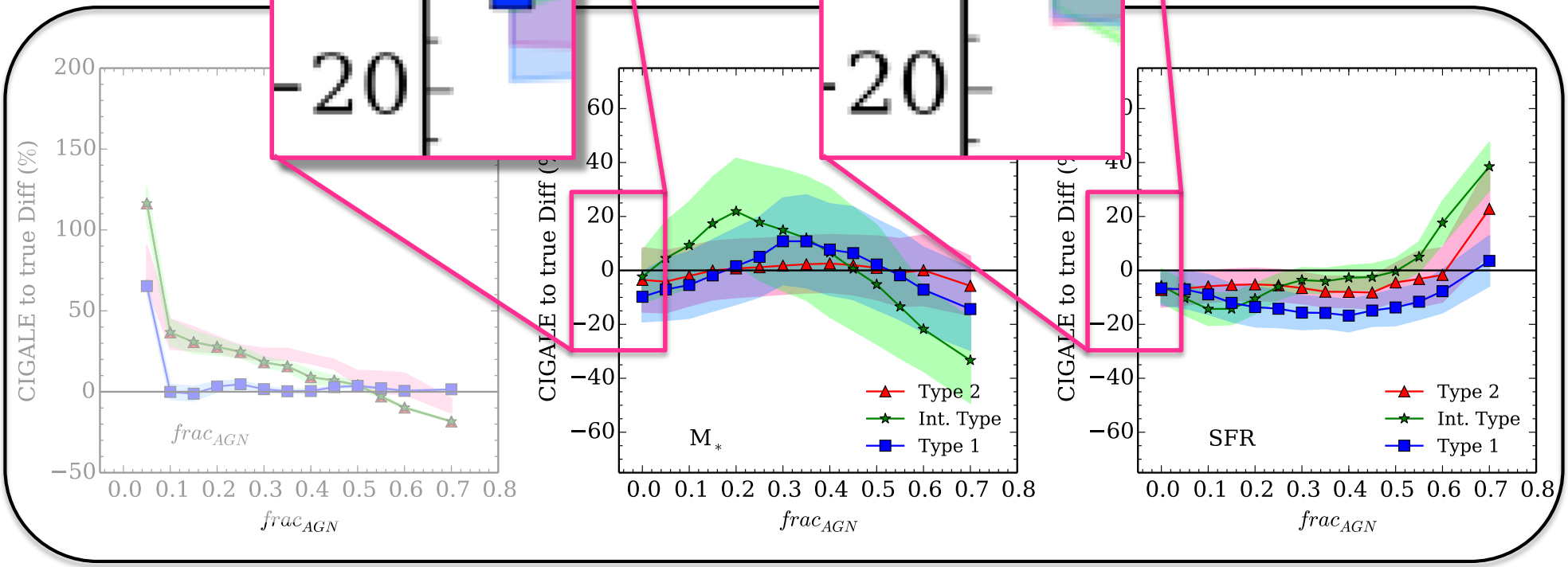
Parameters used for **fitting**



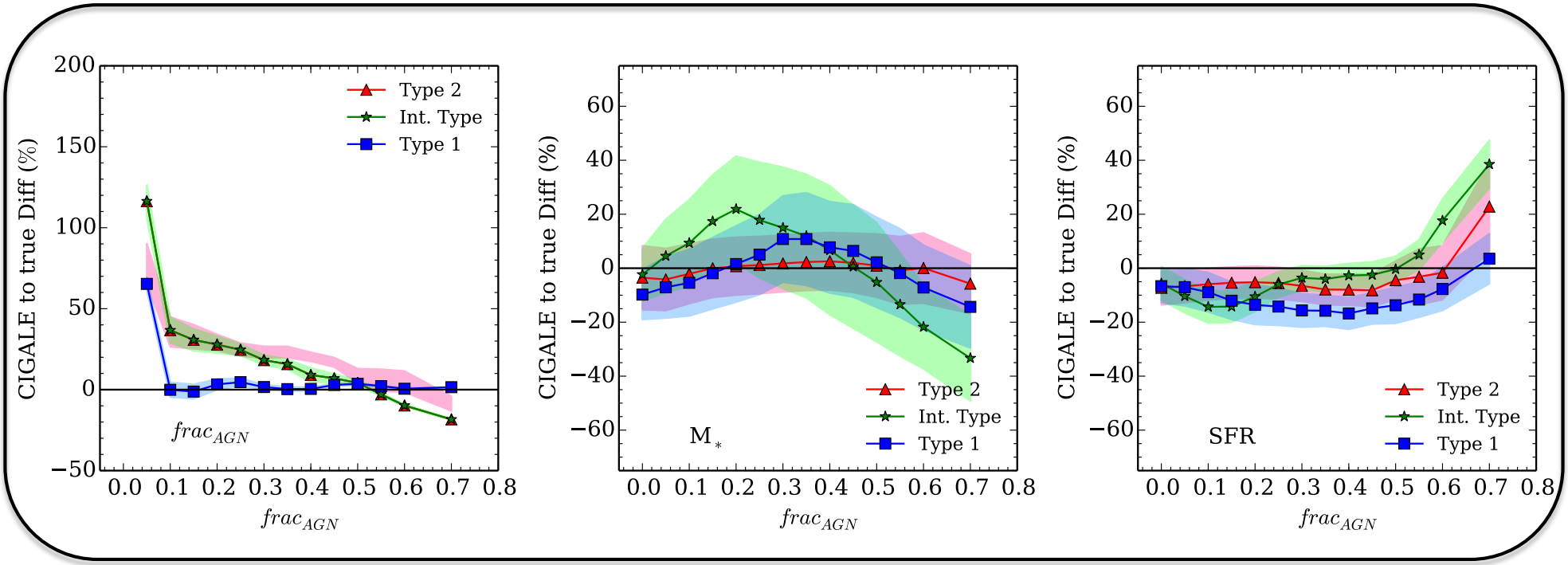
Estimating the AGN contribution, the stellar mass, and the star formation rate



Estimating th tion, the ste he star formation rate



Estimating the AGN contribution, the stellar mass, and the star formation rate



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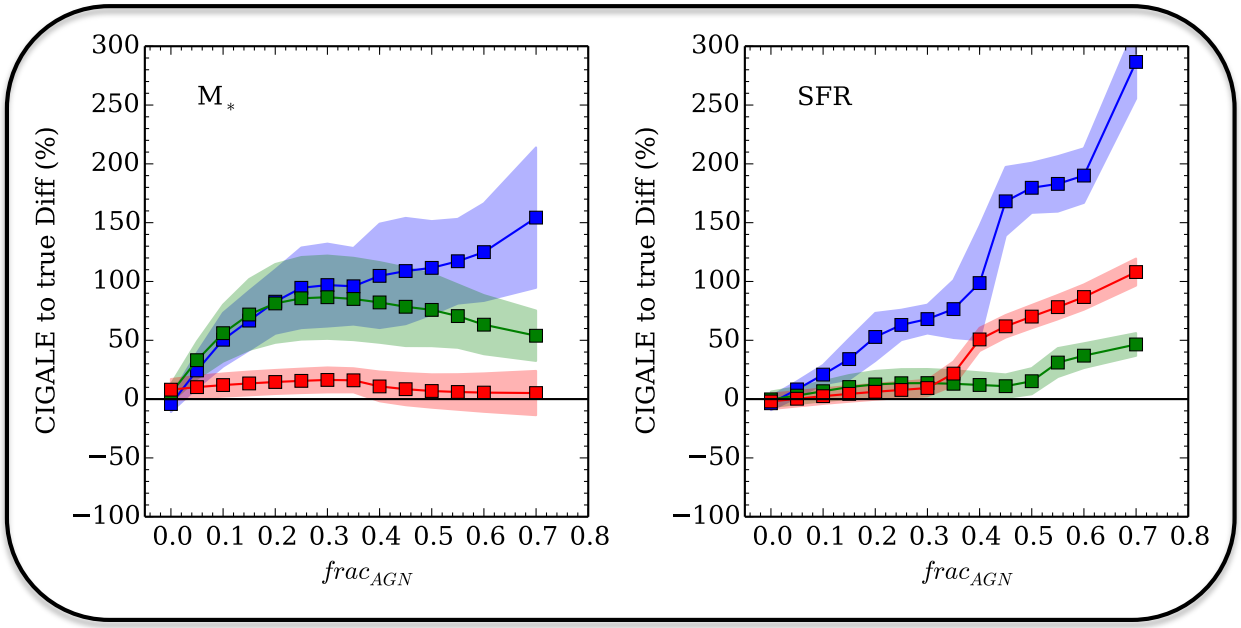

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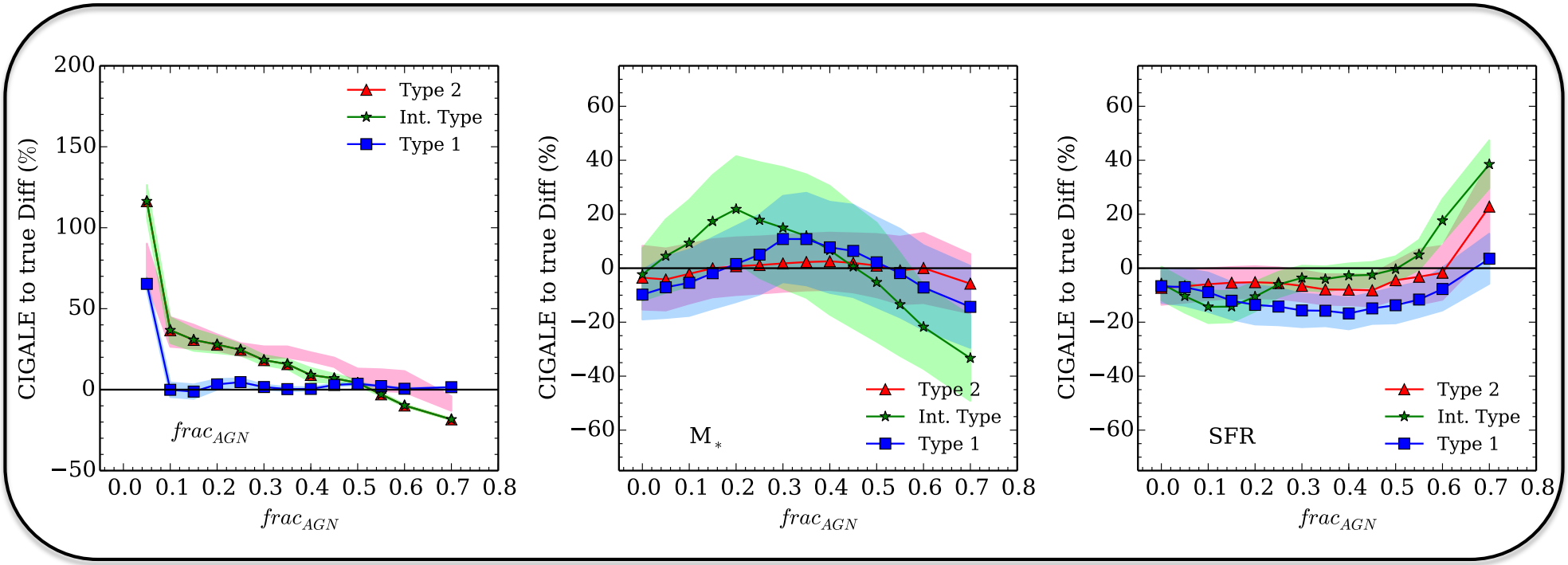

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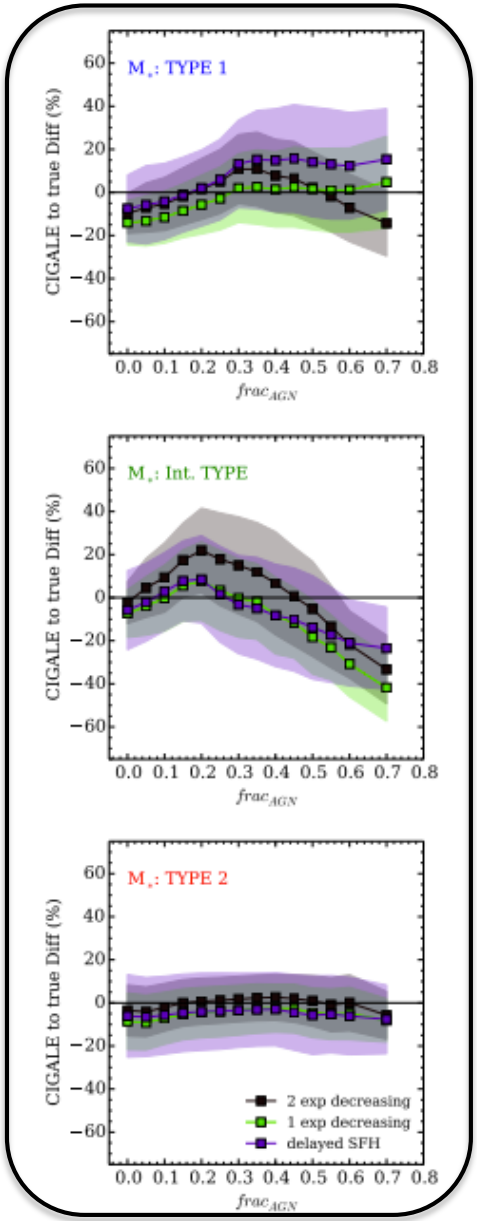
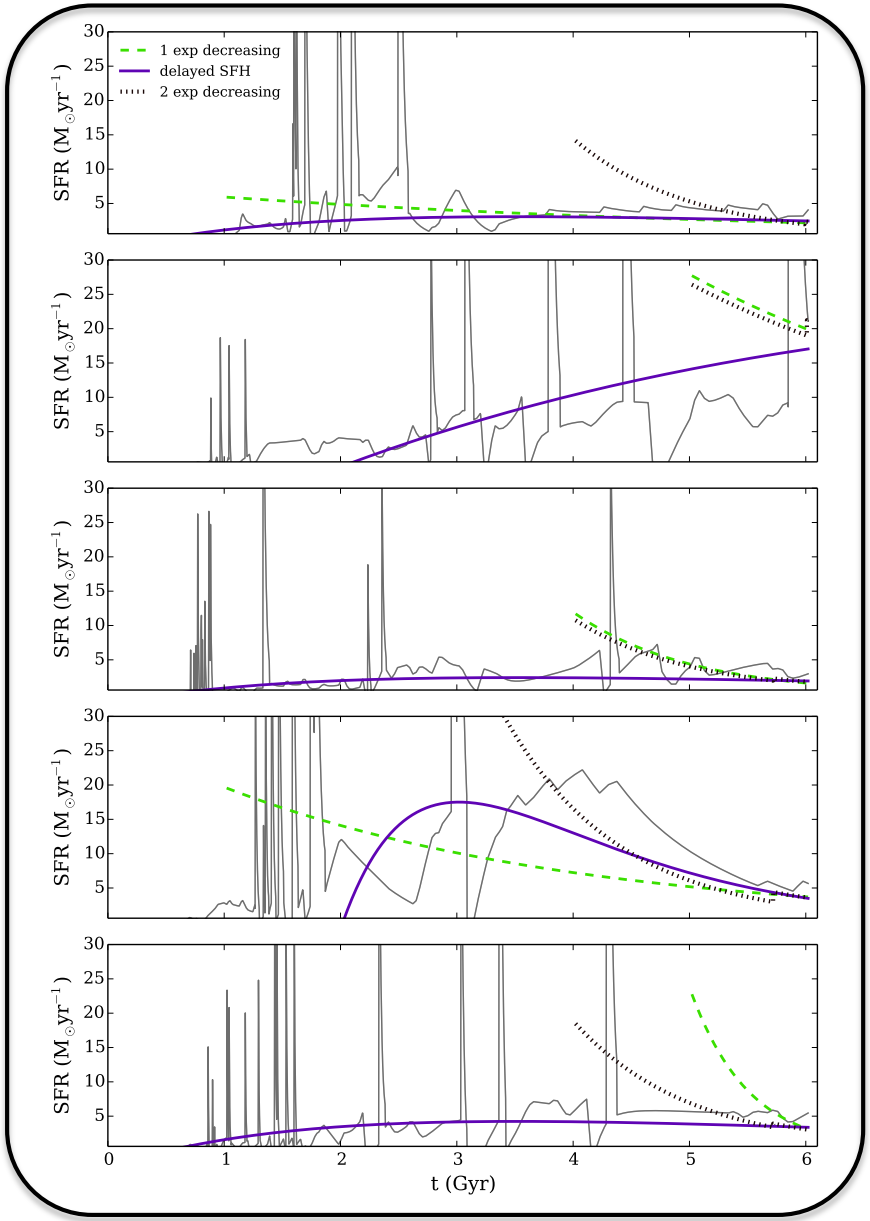


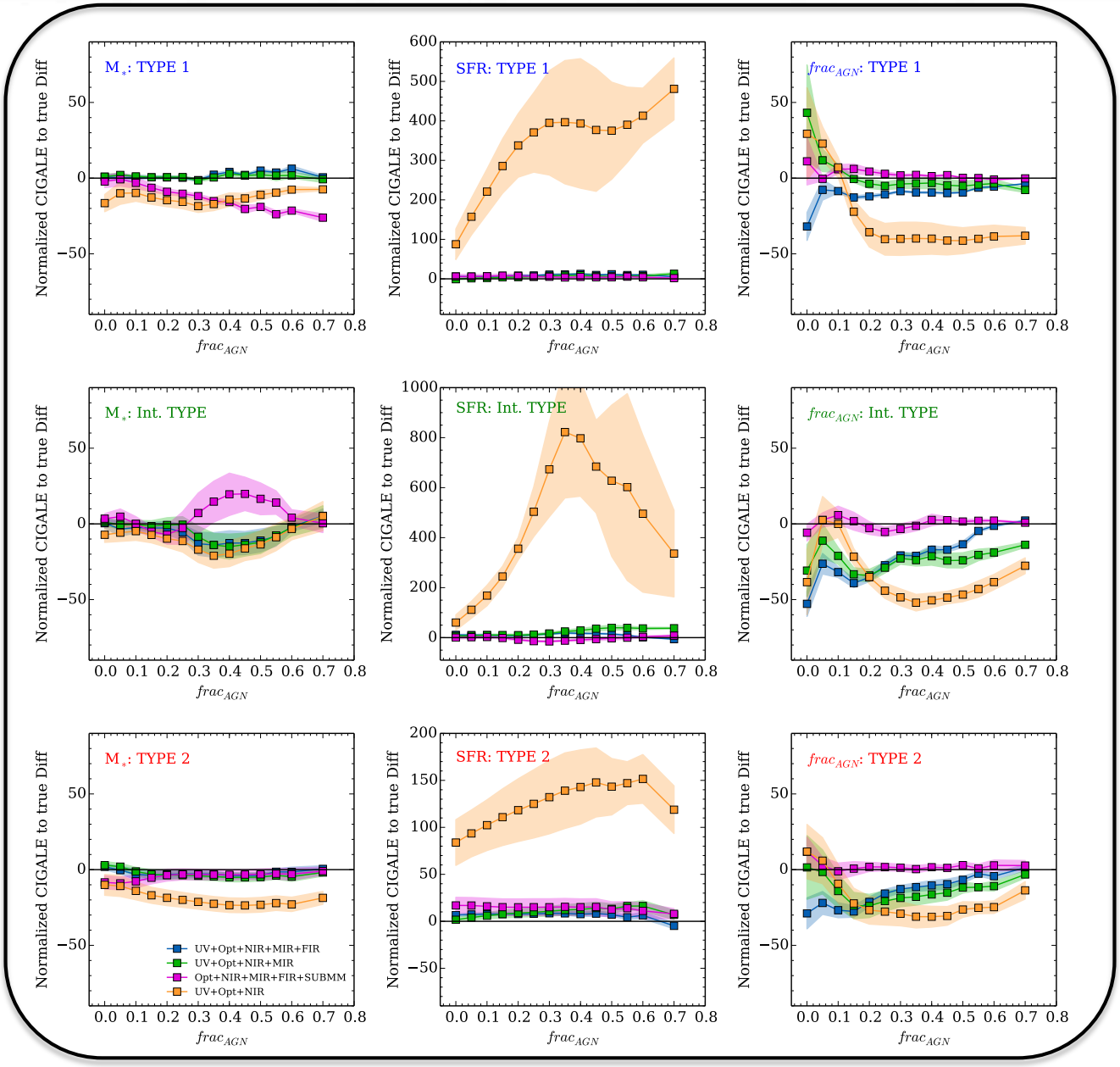
2-exp decrising

delayed

1-exp decrising



What about photometric coverage?



no UV

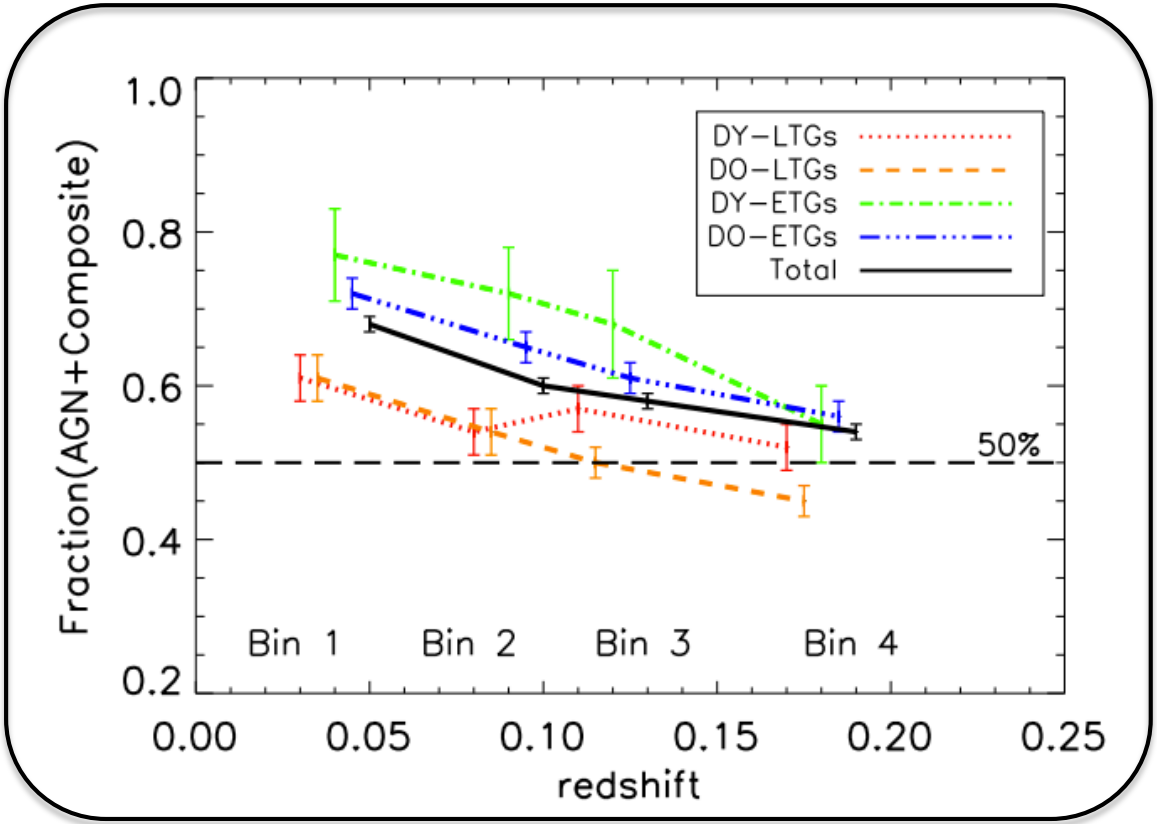
data up to 125 μm RF

data up to 35 μm RF

data up to 4 μm RF

On data:
Hickson Groups

Bitsakis+2015



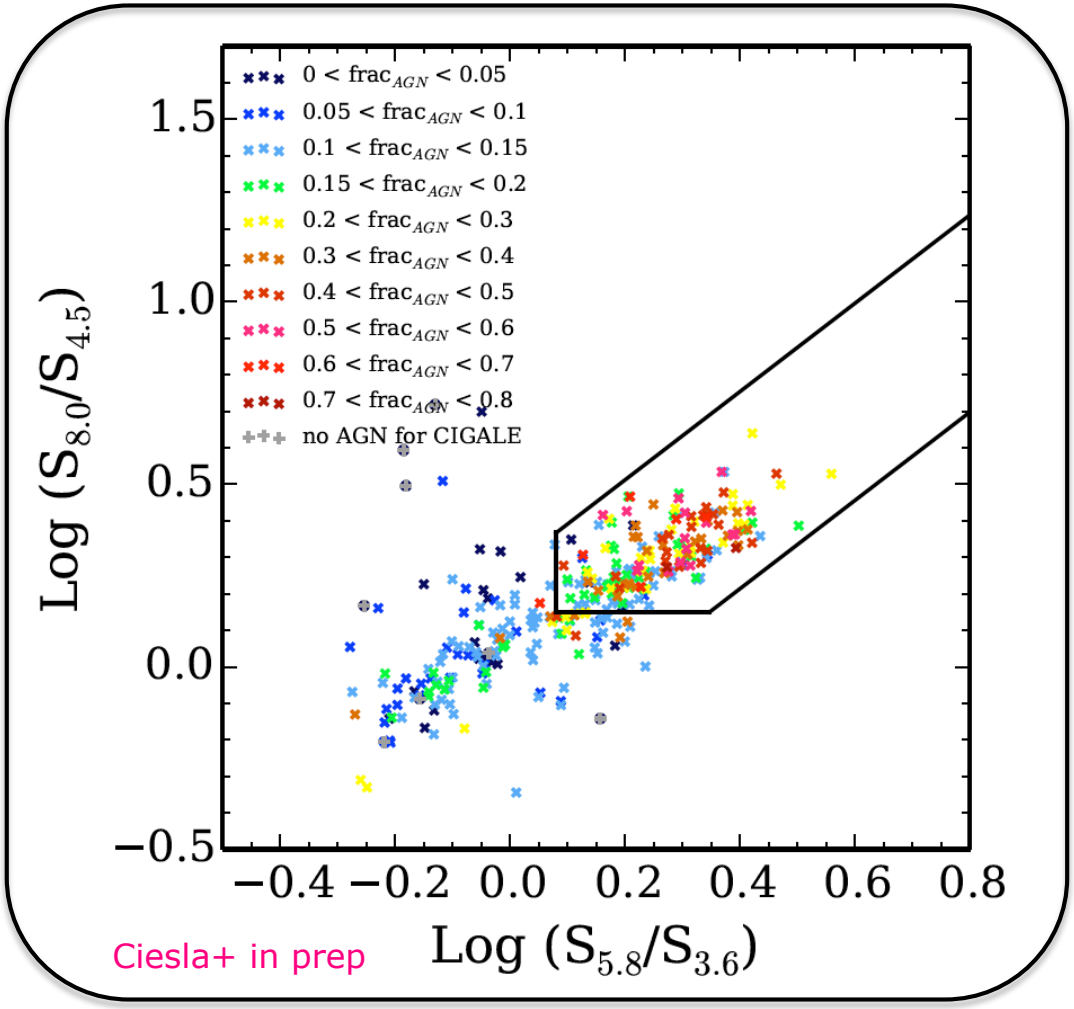
Evolution in compact groups over the last 3 Gyrs.

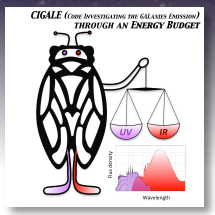
7400 galaxies in 1770 isolated groups.

Number of galaxies hosting an AGN increases with time in compact groups

On data:
Chandra-COSMOS sources

Donley+12 boxes





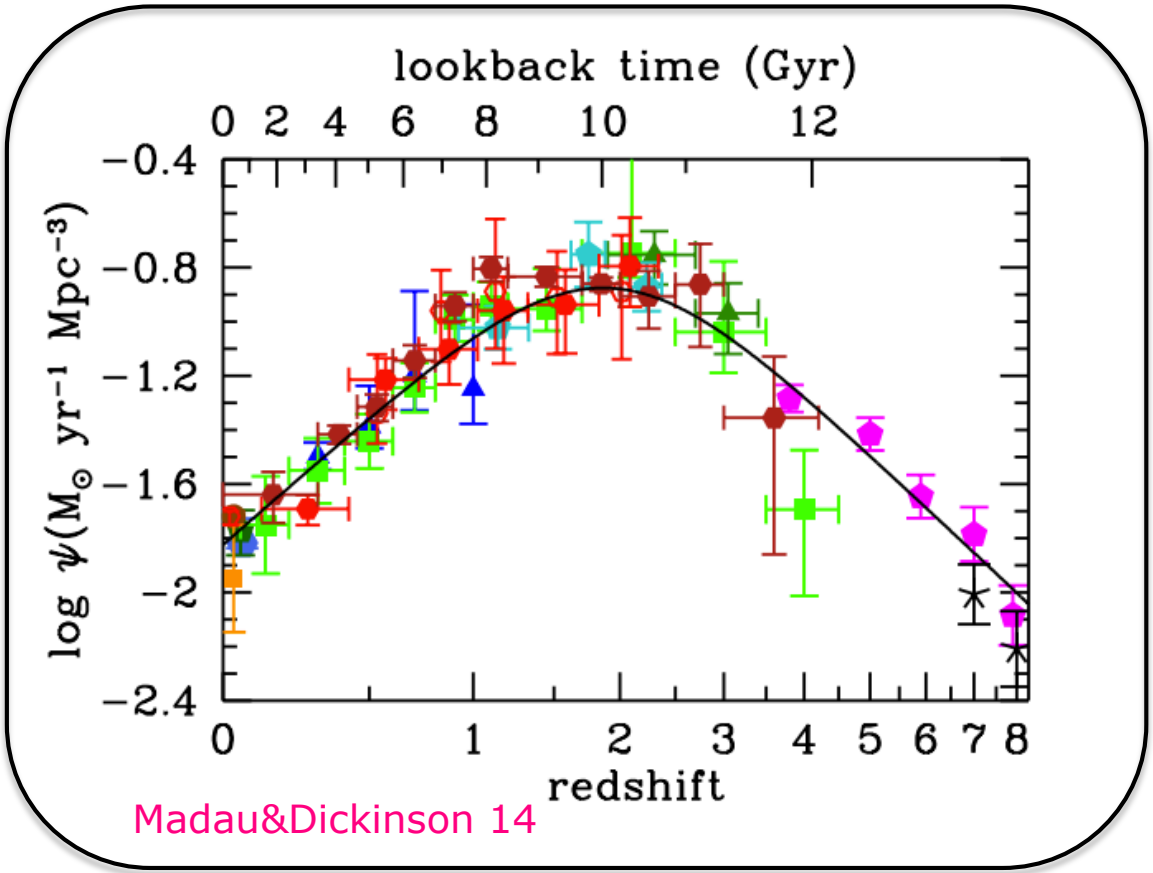
Summary

- CIGALE (and all its functions/modules) is public: **http://cigale.lam.fr/**
  With a strong support from the CIGALE team: **cigale@lam.fr**
- In normal galaxies, M* are recovered within 10% and SFR within 12% for the 3 SFHs considered in this work.
- In AGN, M* are overall well recovered with systematic up to 40%. It is insensitive to photometric coverage as long as UV-MIR data are available.
- In AGN, SFR suffers from systematic up to 50% as long as FIR/submm data are available.
- When data is available only up to MIR, the SFR cannot be recovered.
- AGN/galaxy decomposition based on broad-band photometry can lead to significant overestimation of the AGN contribution for weak AGN.

Ciesla+15
Bitsakis+15
Buat +14
Burgarella+15 in prep
Boquien+15 in prep

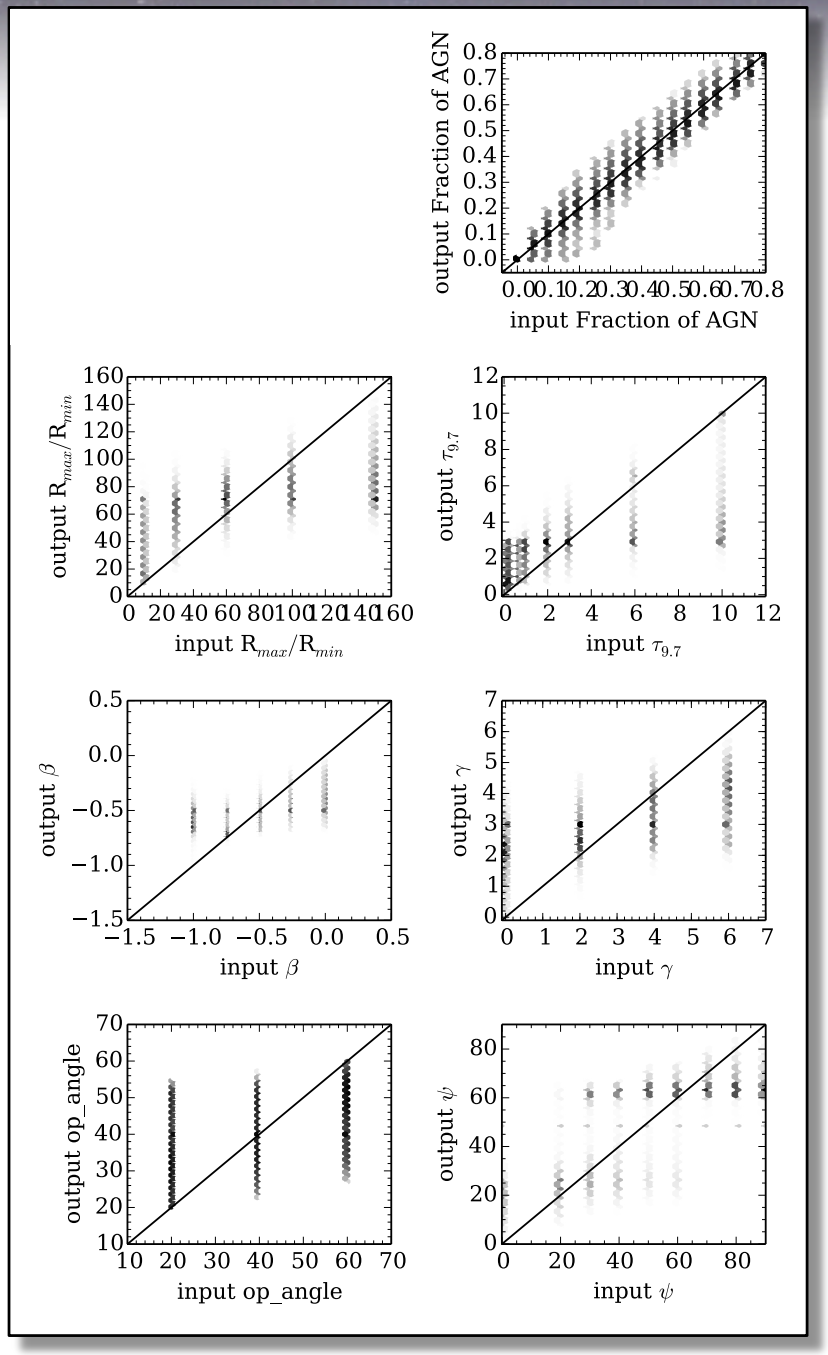
About CIGALE (w/woAGNs):
Bitsakis #55
Burgarella #33
Vika #34
Talk by A. Maragkoudakis

Here it is!

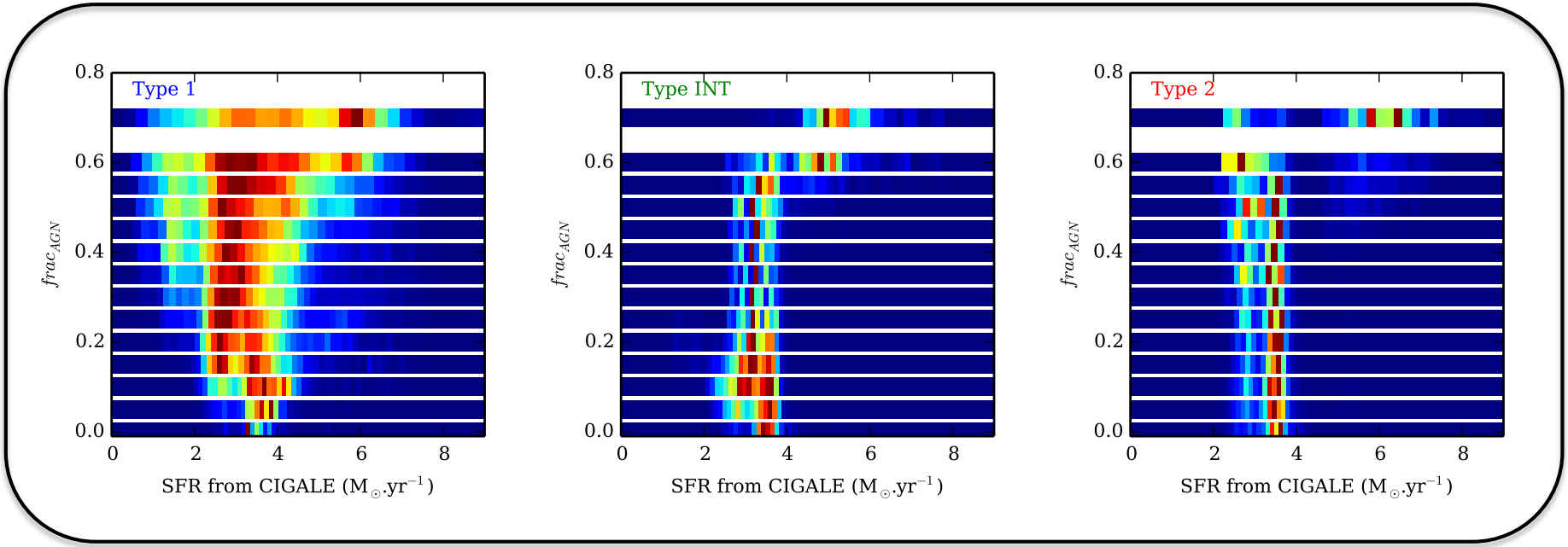


Thank you!

Constraining AGN torus geometry parameter

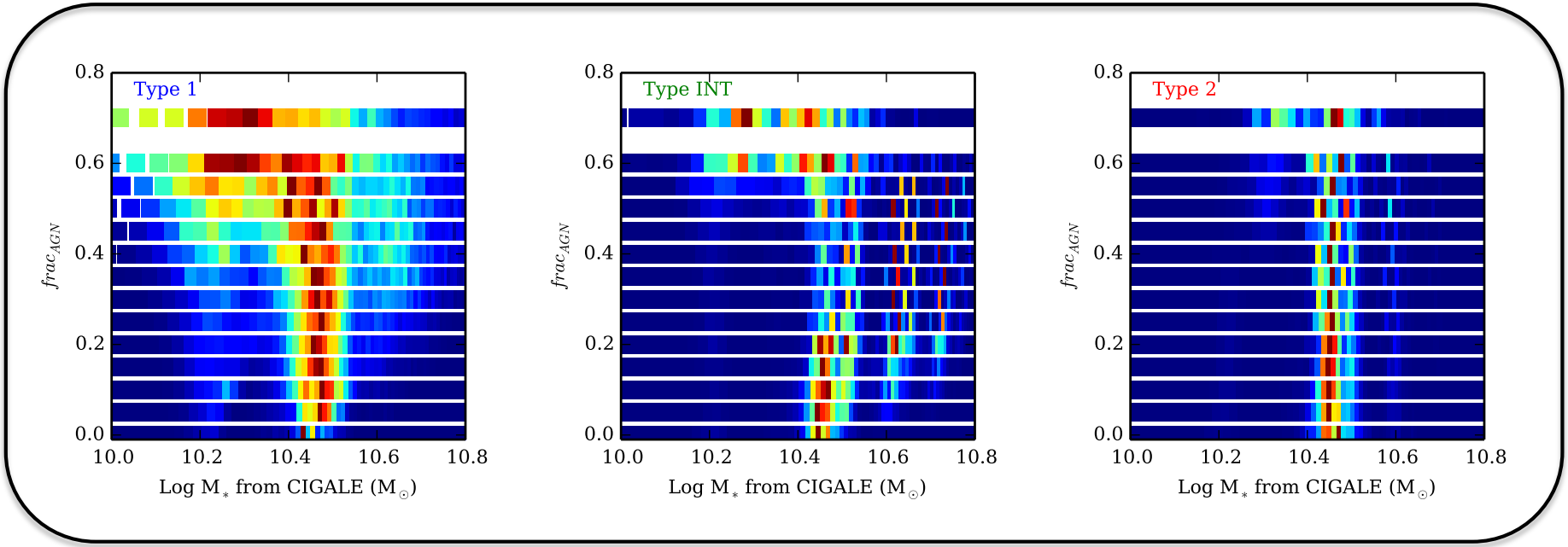


Estimating the AGN contribution, the stellar mass and the star formation rate



Probability Distribution Function of SFR

Estimating the AGN contribution, the stellar mass and the star formation rate



Probability Distribution Function of M_*

Known problem with PDF analysis

Noll+09
Buat+12