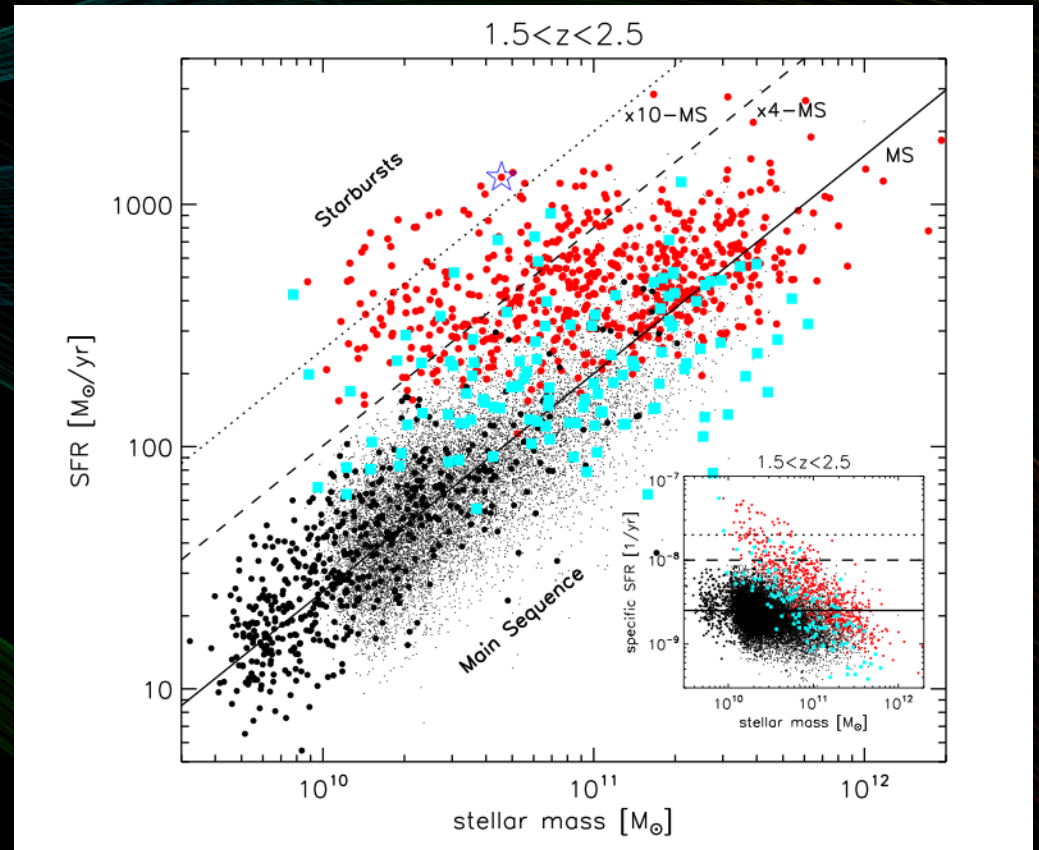


Probing the AGN - Star formation connection through the Lens of the Star Formation Reference Survey (SFRS)

**Alexandros Maragkoudakis
University of Crete
Foundation for Research and Technology - Hellas (FORTH)**

A. Zezas, P. Bonfini, M. Ashby, S. Willner, L. Ciesla

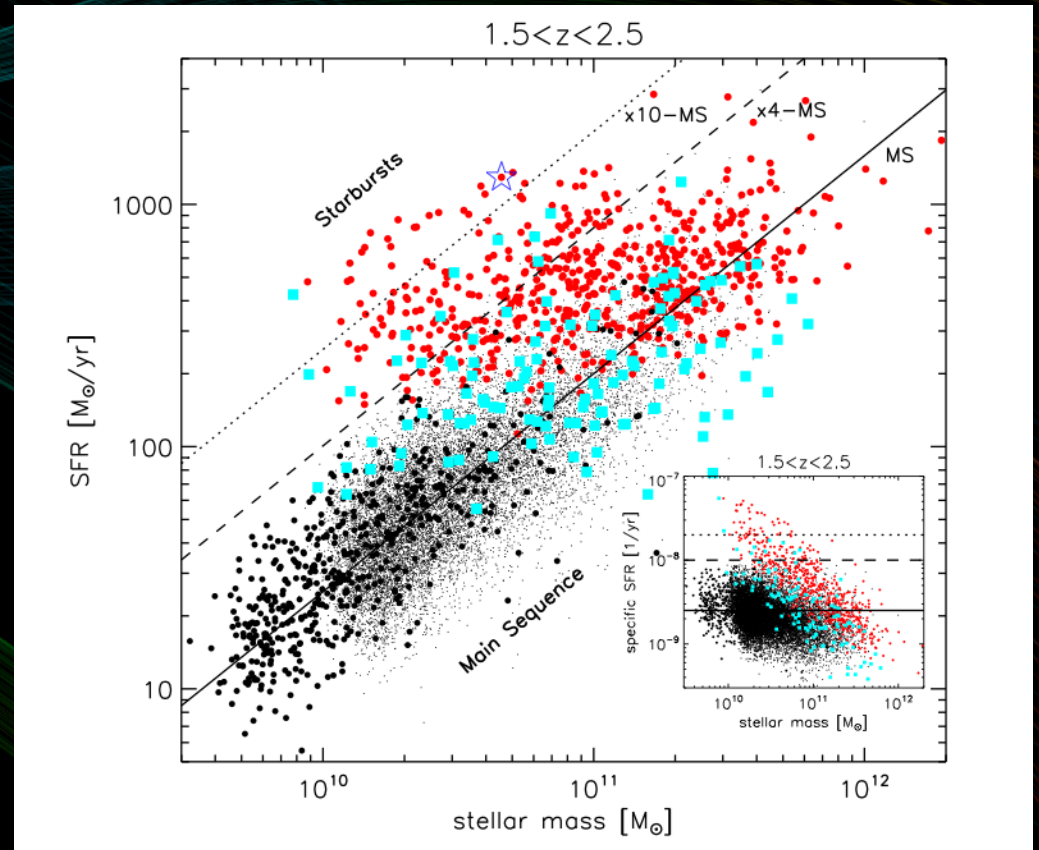
- **Fundamental galaxy properties :**
 - **Star formation rate (SFR)**
 - **Stellar mass**
- **Variety of results depending on the methods used to derive them.**
- **Importance to set constraints and accurately measure them.**



G. Rodighiero et al. 2011

What we need:

- A well-defined sample of galaxies.
- Precise methods to identify activity types.
- Constrains on the galaxy properties.

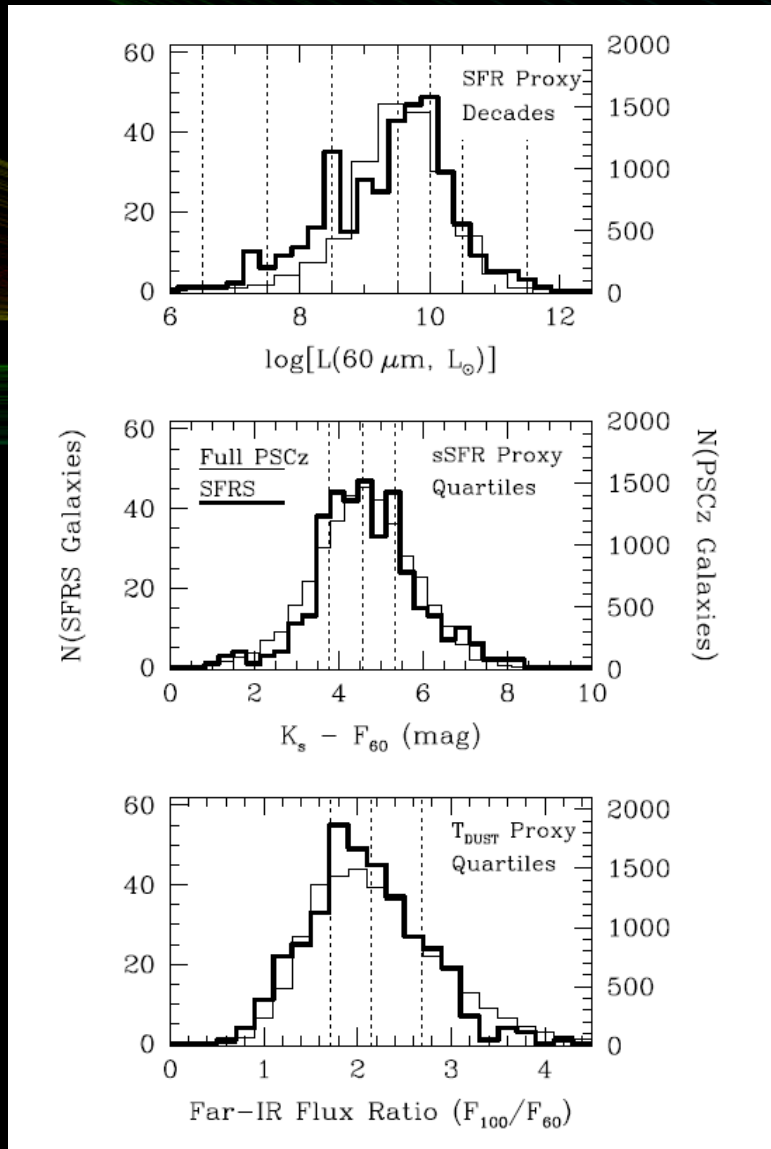


G. Rodighiero et al. 2011

The Star Formation Reference Survey (SFRS)

(Ashby et al. 2011)

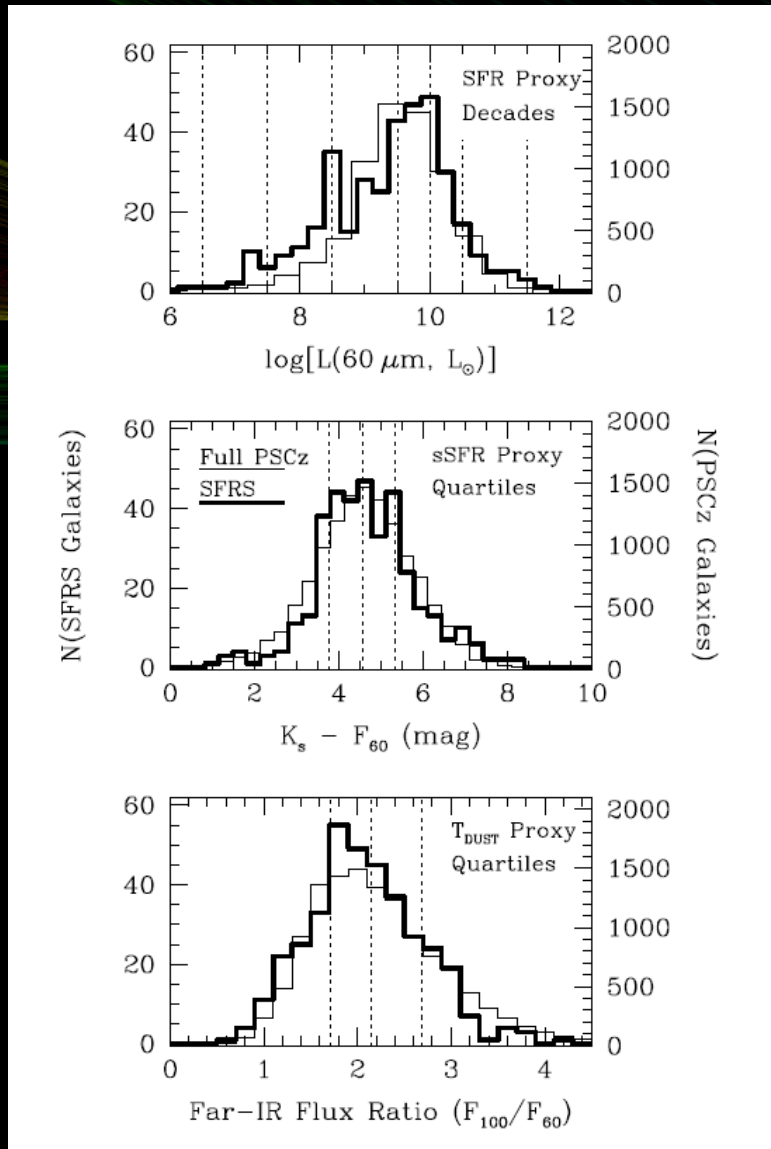
- 369 Infrared selected nearby galaxies representative of the 3D-space:
 - Star Formation Rate (SFR)
 - Specific SFR (sSFR)
 - Interstellar dust temperature



The Star Formation Reference Survey (SFRS)

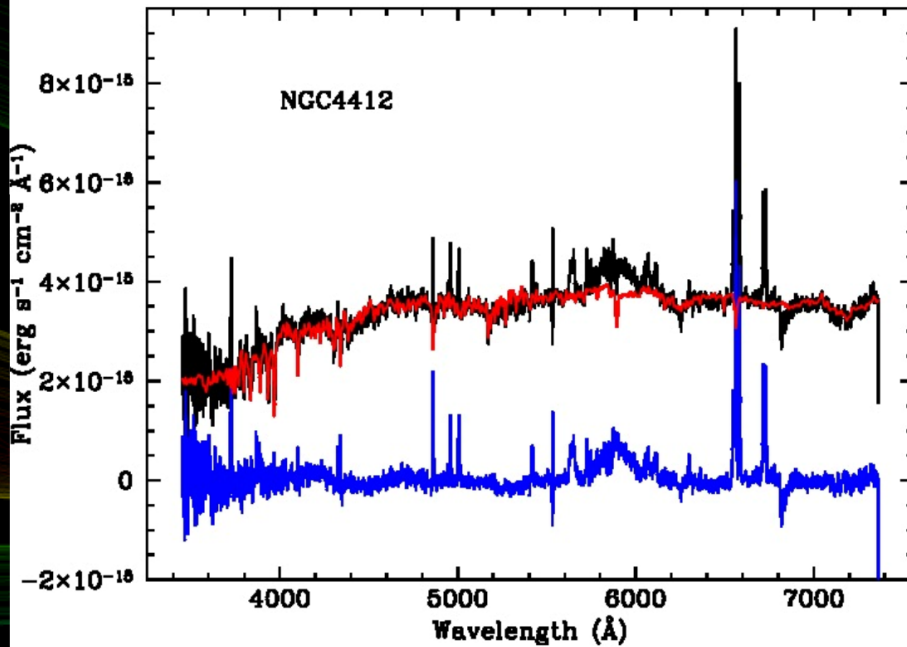
(Ashby et al. 2011)

- 369 Infrared selected nearby galaxies representative of the 3D-space:
 - Star Formation Rate (SFR)
 - Specific SFR (sSFR)
 - Interstellar dust temperature



Waveband	Observatory	Sample Coverage
1.4 Ghz	VLA/NVSS	100%
12, 25, 60, 10 μm	IRAS	100%
24 μm	Spitzer/MIPS	70%
3.6, 4.5, 5.8, 8.0 μm	Spitzer/MIPS	100%
JHKs	2MASS	100%
ugriz	SDSS	100%
Optical Spectra	SDSS/FLWO	100%
Ha imaging	NAOC	30% (on-going)
0.13-0.28 μm	GALEX	90%

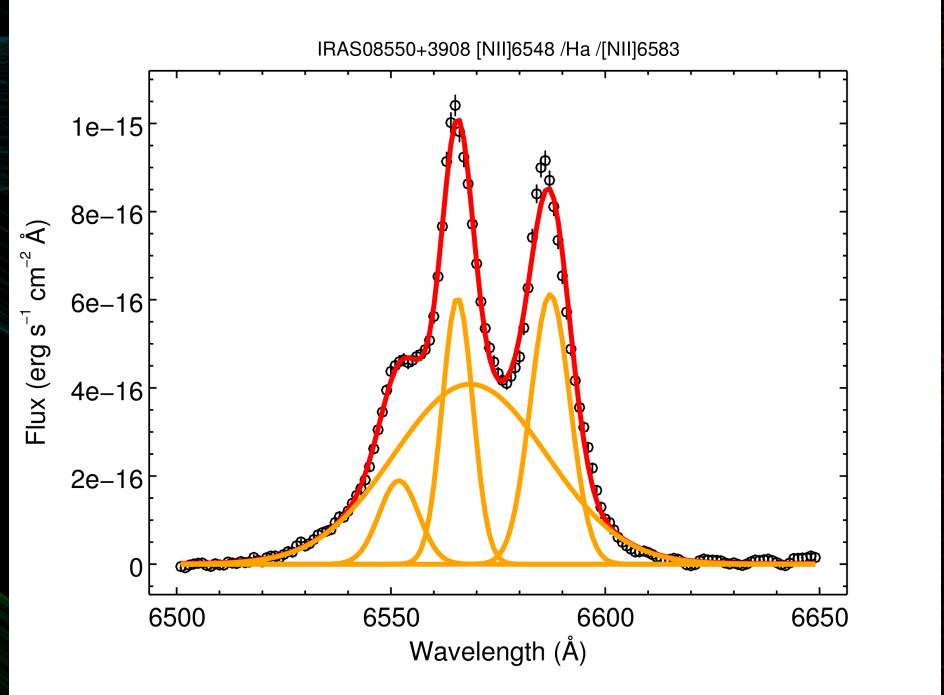
Star-light Subtracted Integrated & Nuclear Spectra



STARLIGHT code (Cid
Fernandes et al. 2005)

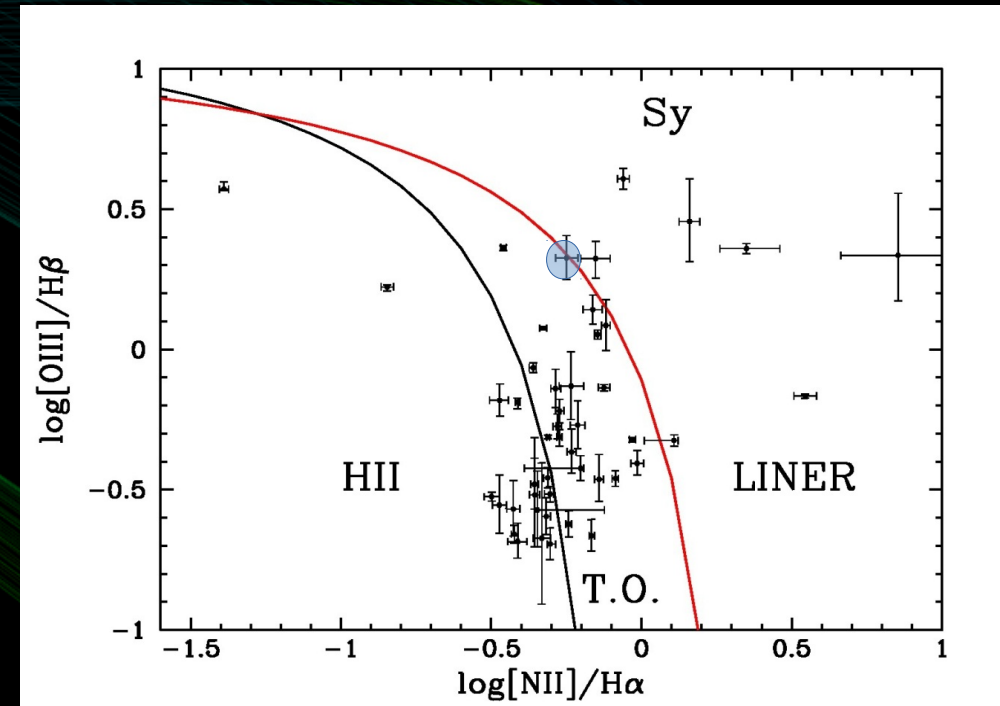
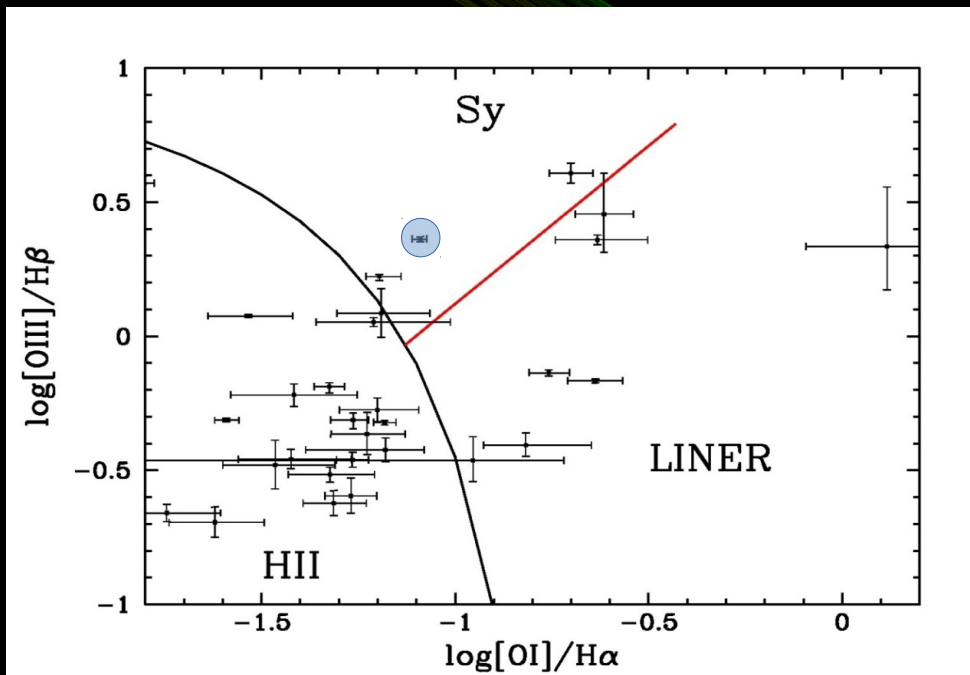
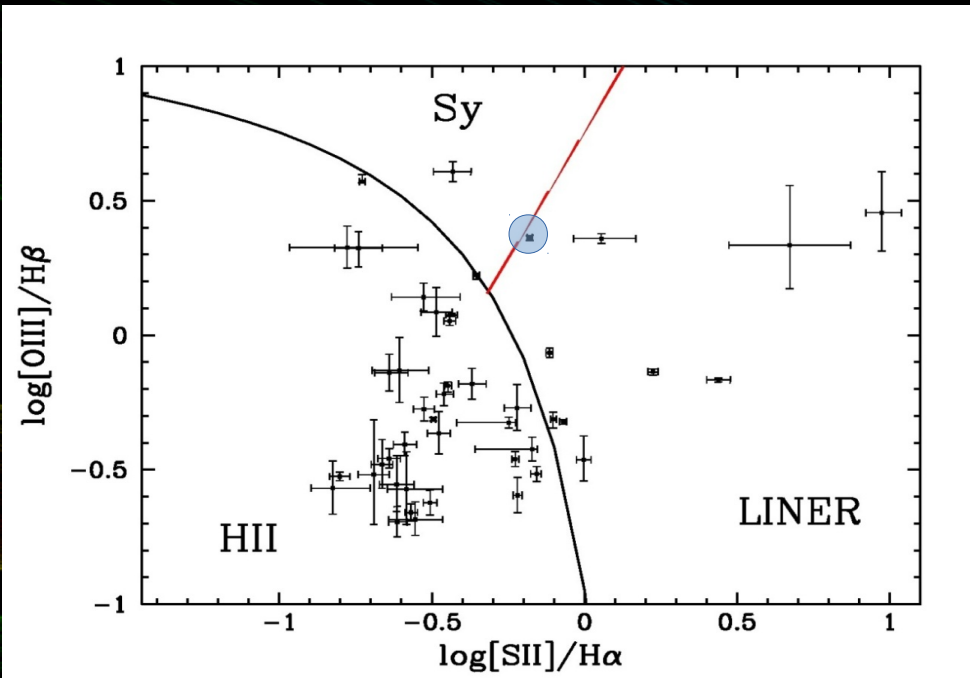
- Bruzual & Charlot (2003) SPS libraries
- 23 ages between 1Myr – 13Gyr
- 6 metallicities between 0.005 – $2.5 Z_{\odot}$

GDSF 2015 - Alexandros Maragkoudakis



Multi-component fitting with
SHERPA (Freeman et al. 2001)

- Spectroscopic Activity Classification Diagnostics
- Introducing a Probabilistic Classification Scheme



Maragkoudakis et al. (in prep.)

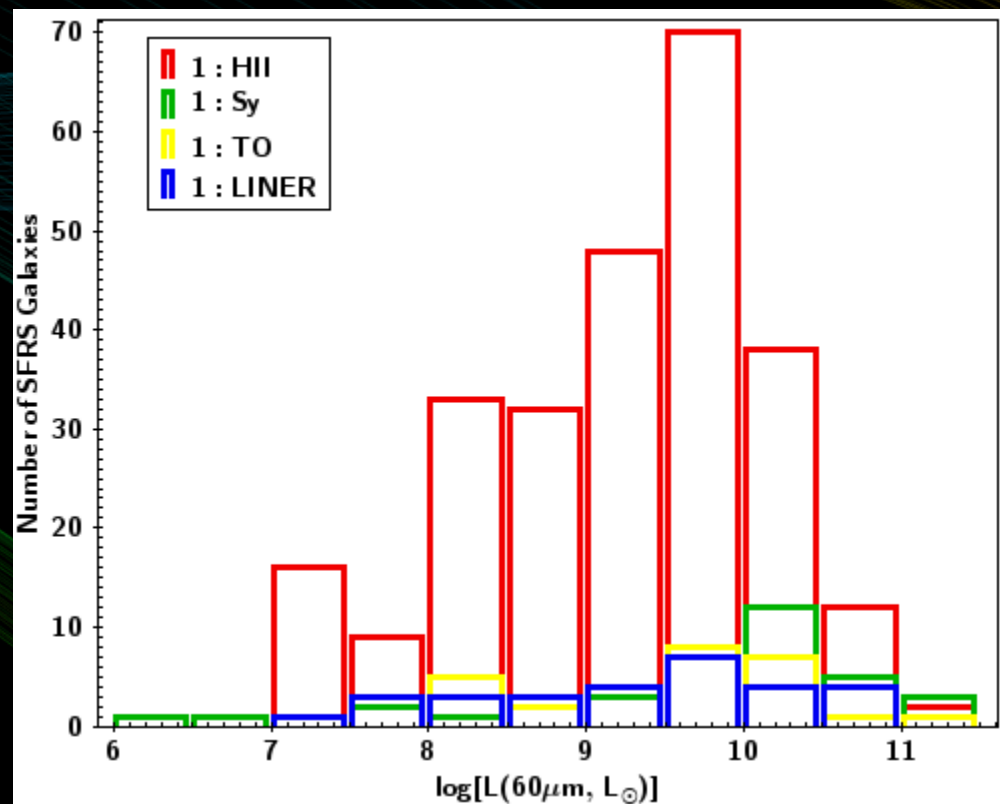
Spectroscopic Activity Classification

264 Starforming (71% of the total SFRS sample)

43 Seyfert (Sy) (12%)

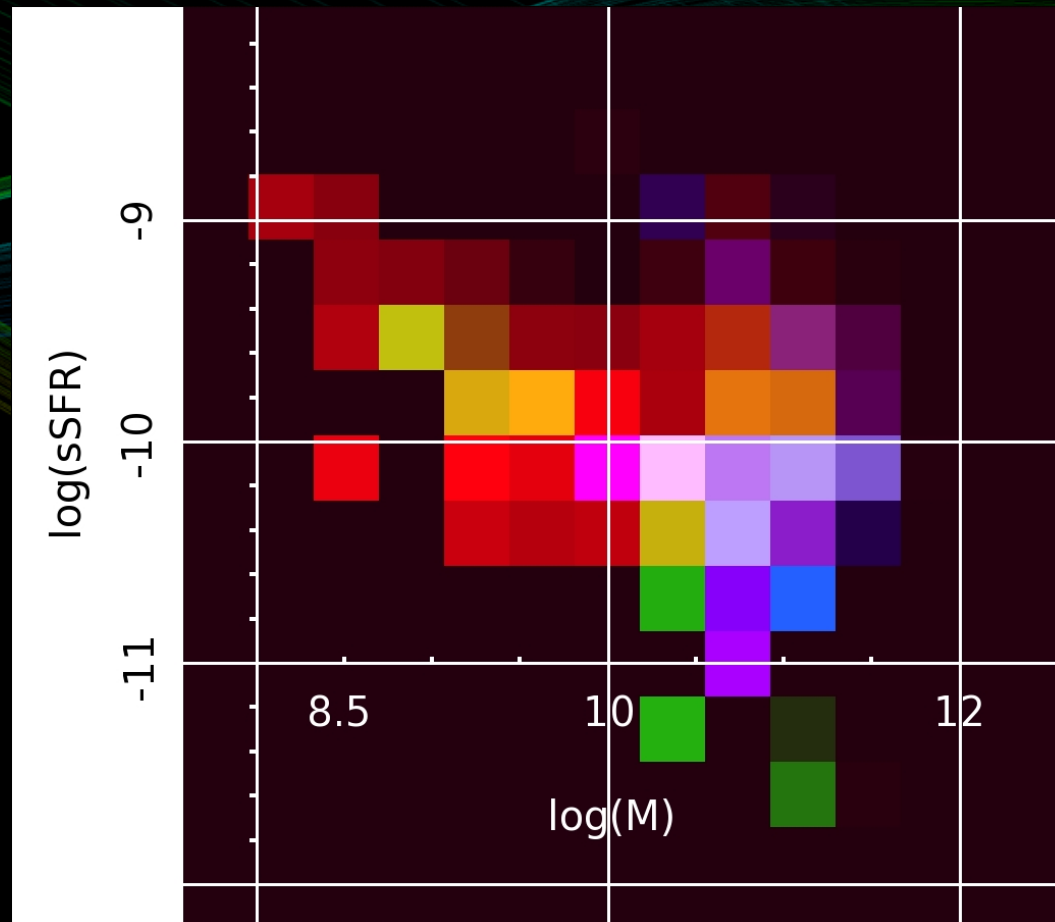
37 Transition Objects (TO) (10%)

25 LINER (7%)



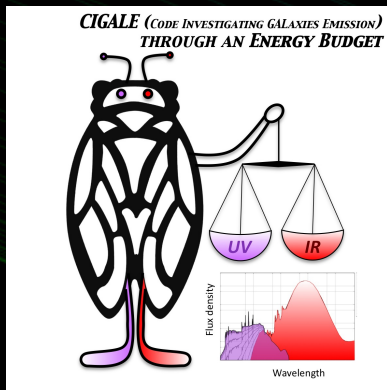
The Bi-variate sSFR – M_* Function

- Star-forming
- AGN – TO
- LINER



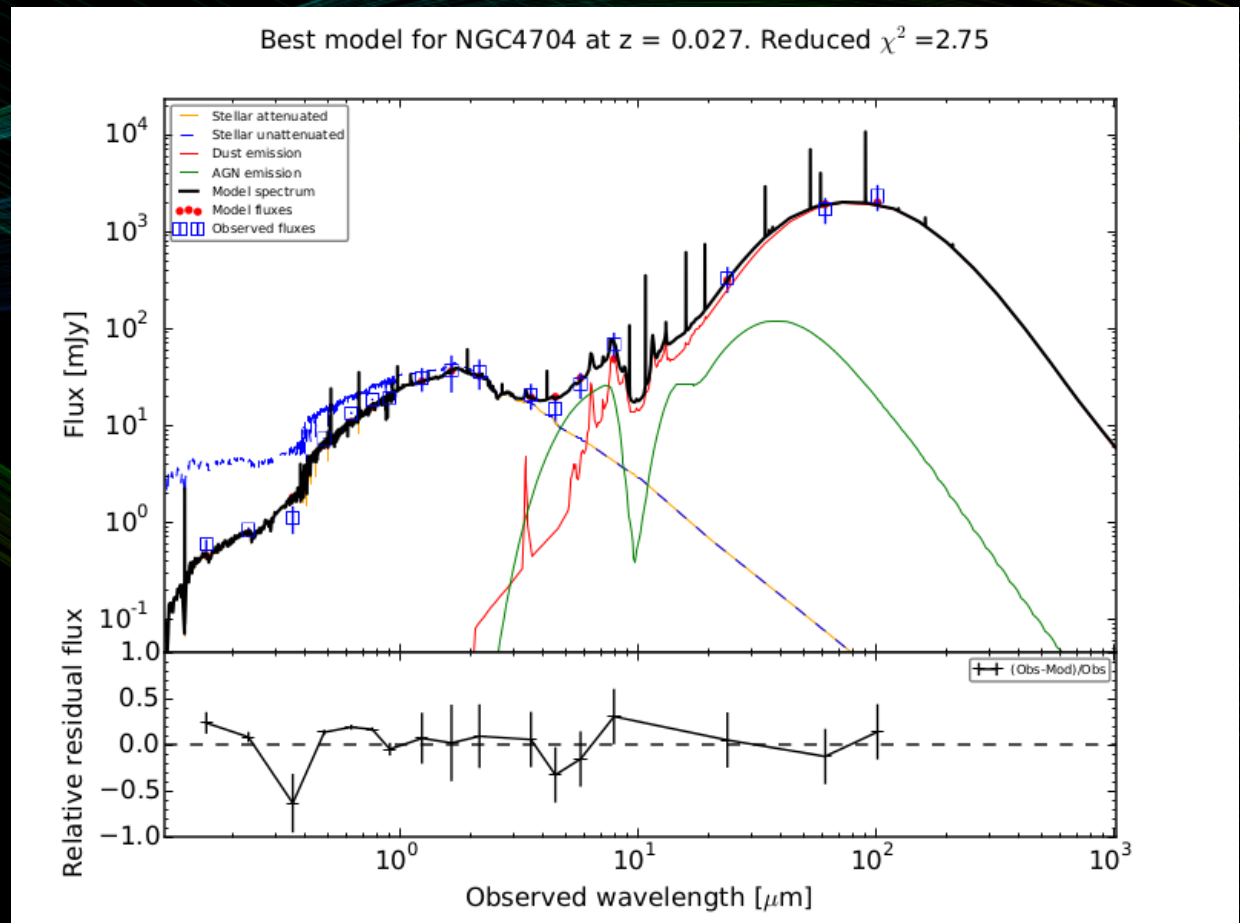
Bonfini et al. (in prep.)

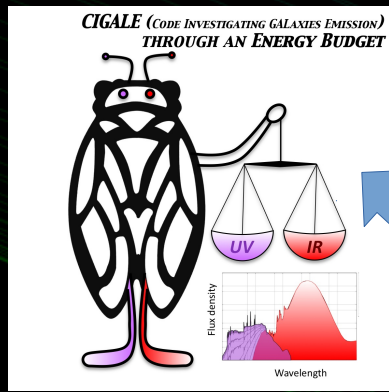
Maragkoudakis et al. (in prep.)



Using SED Fitting to Derive the AGN Fraction

- Double-exp SFH
- Bruzual and Charlot (2003) SPS libraries
- Dale et al. (2014) two component IR models
- Fritz et al. (2006) AGN models

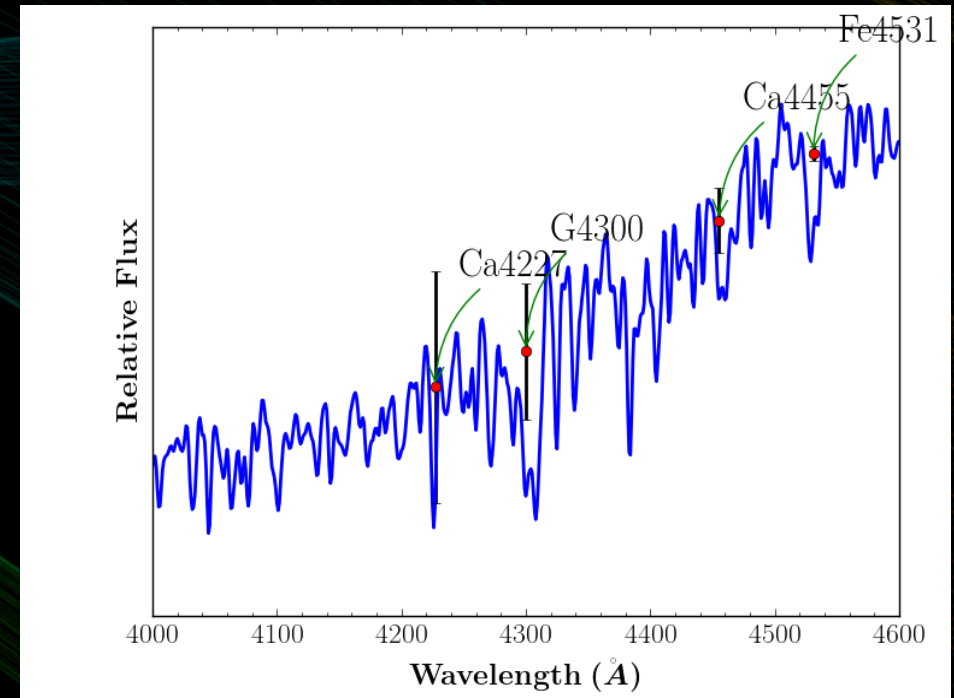




Using Spectro – Photometric SED Fitting (**S – P SED**)

Modified

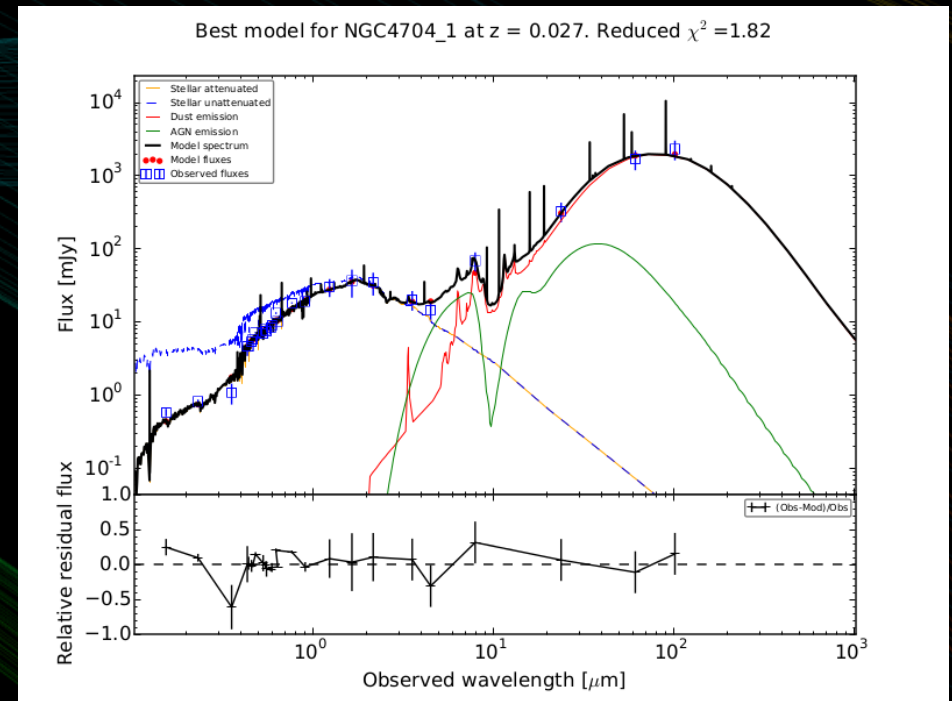
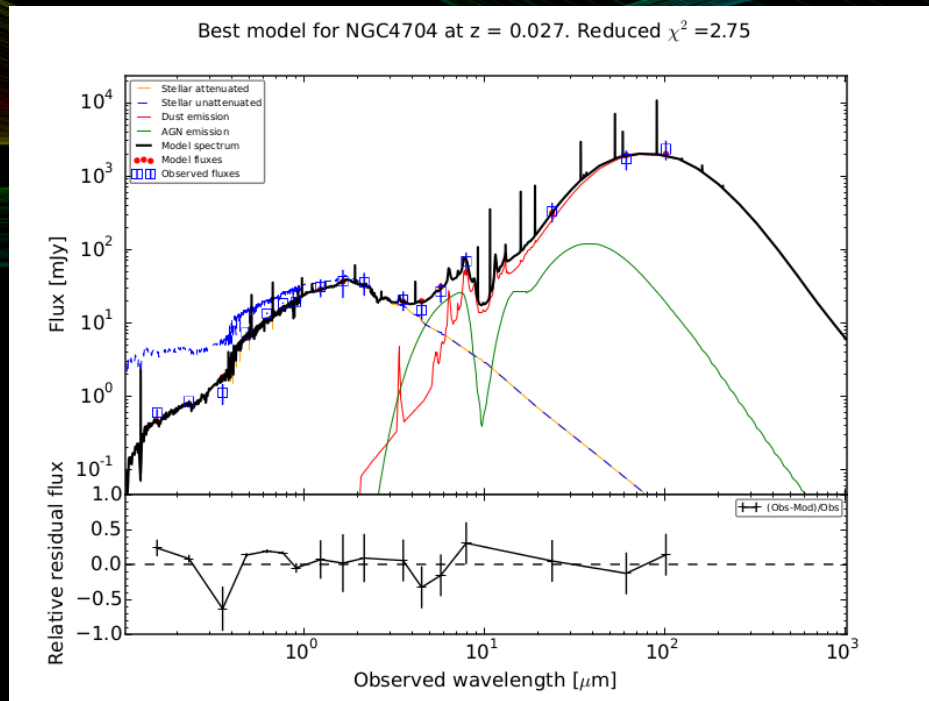
- **High Resolution** Bruzual and Charlot (2003) SPS libraries
- Using **spectral information** to constrain stellar populations.
- Creating **spectral filters** from spectral lines / regions to use in the SED fitting.



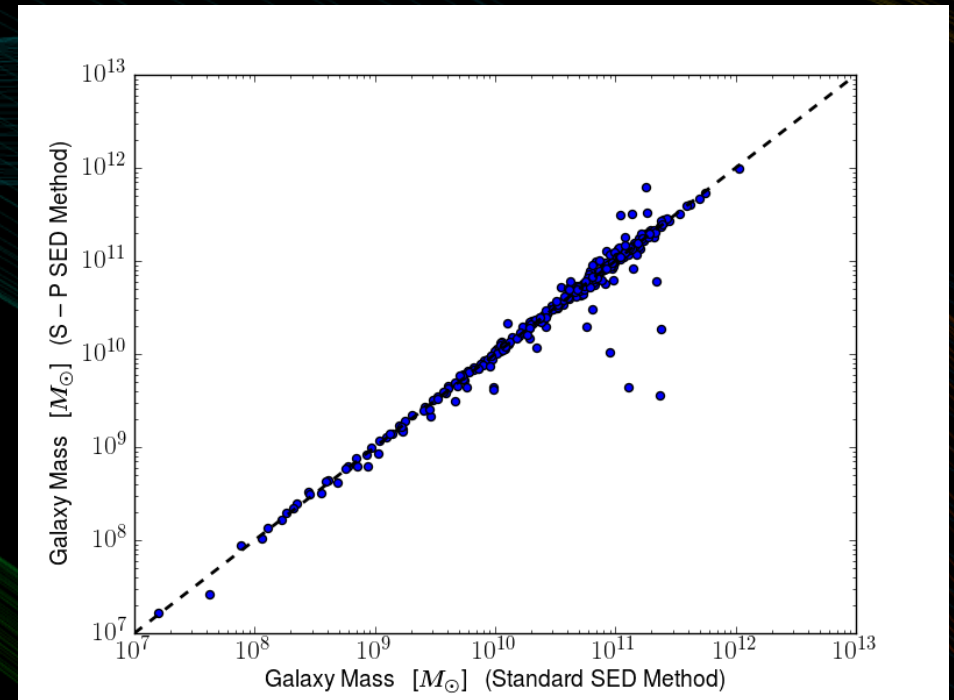
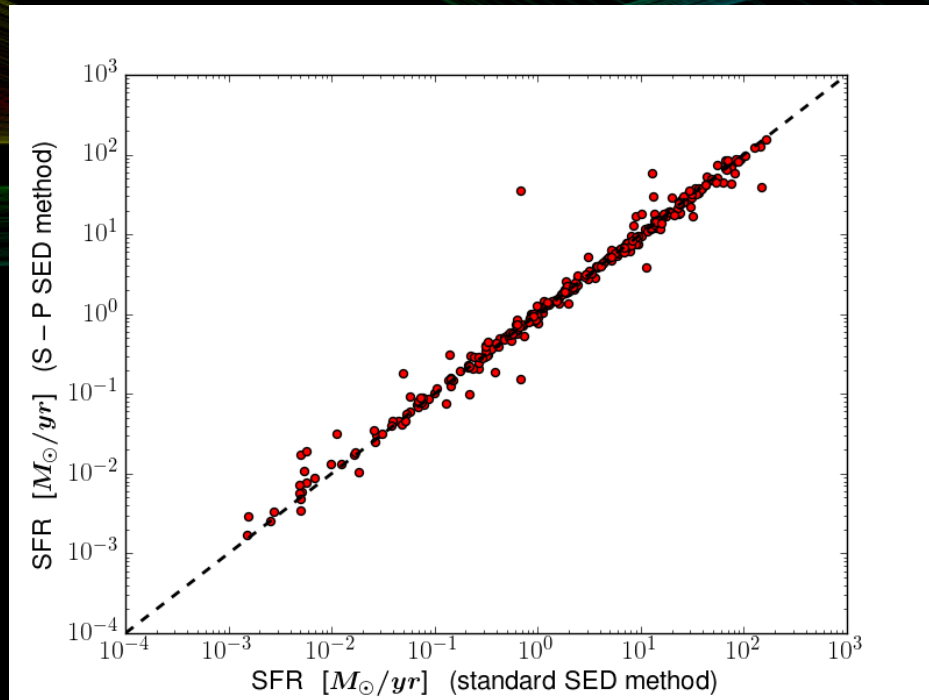
Standard SED Method

VS

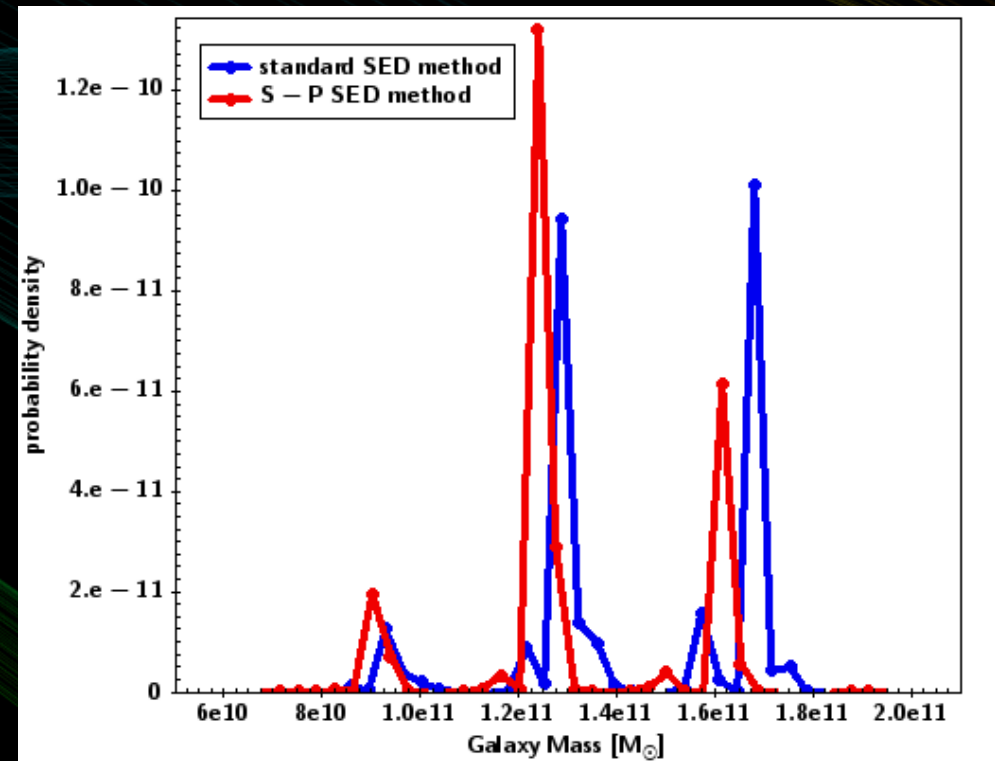
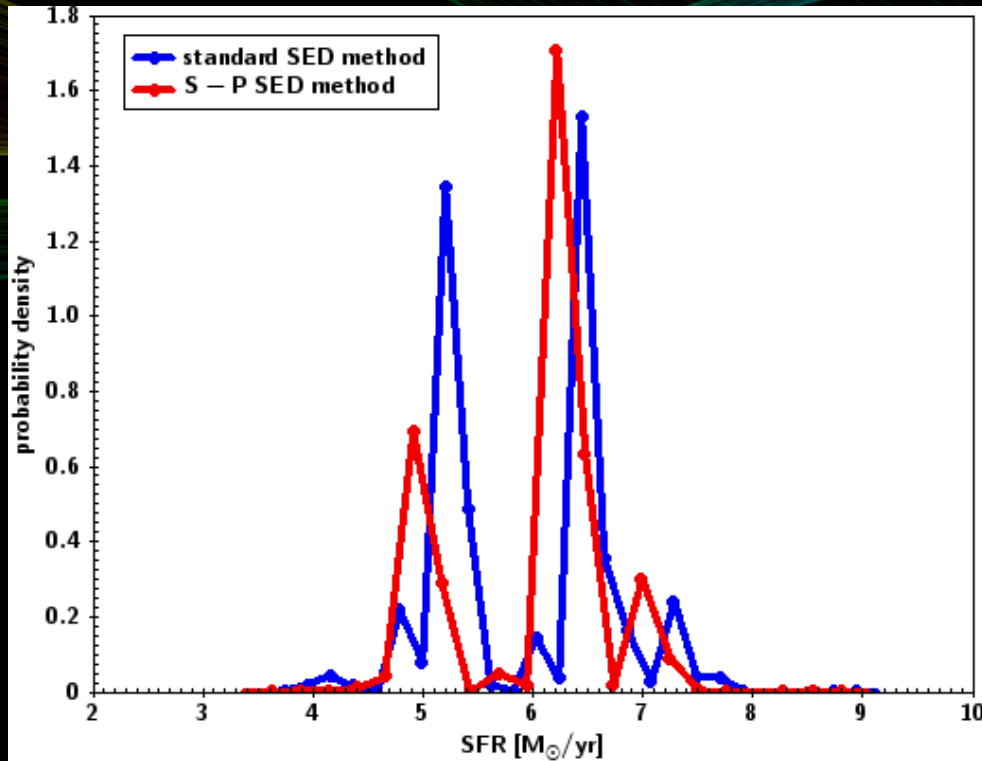
S - P SED Method



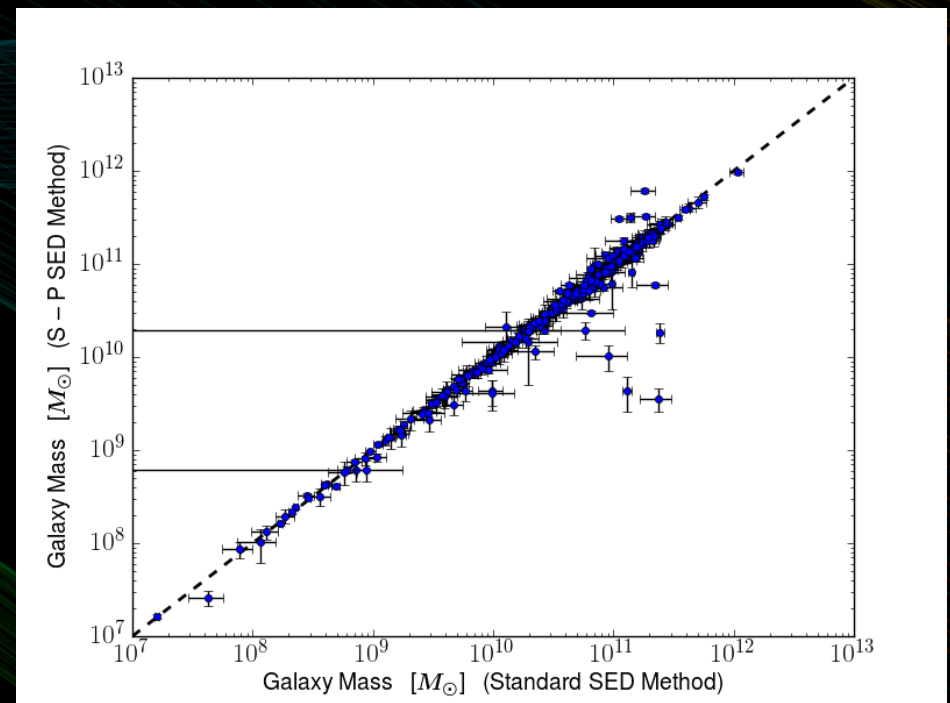
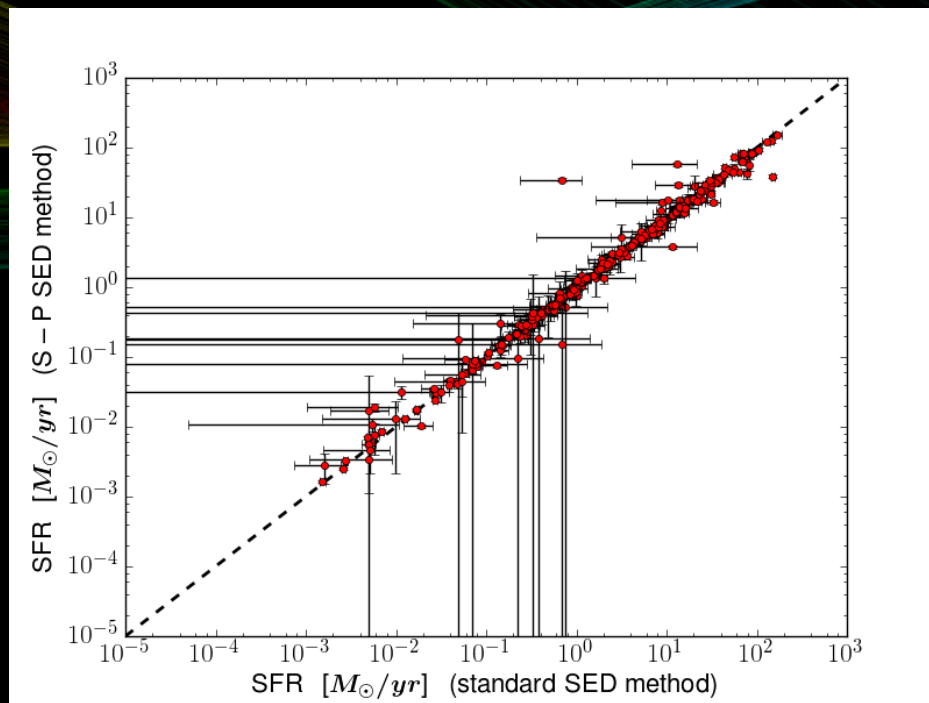
Consistency



Improvement

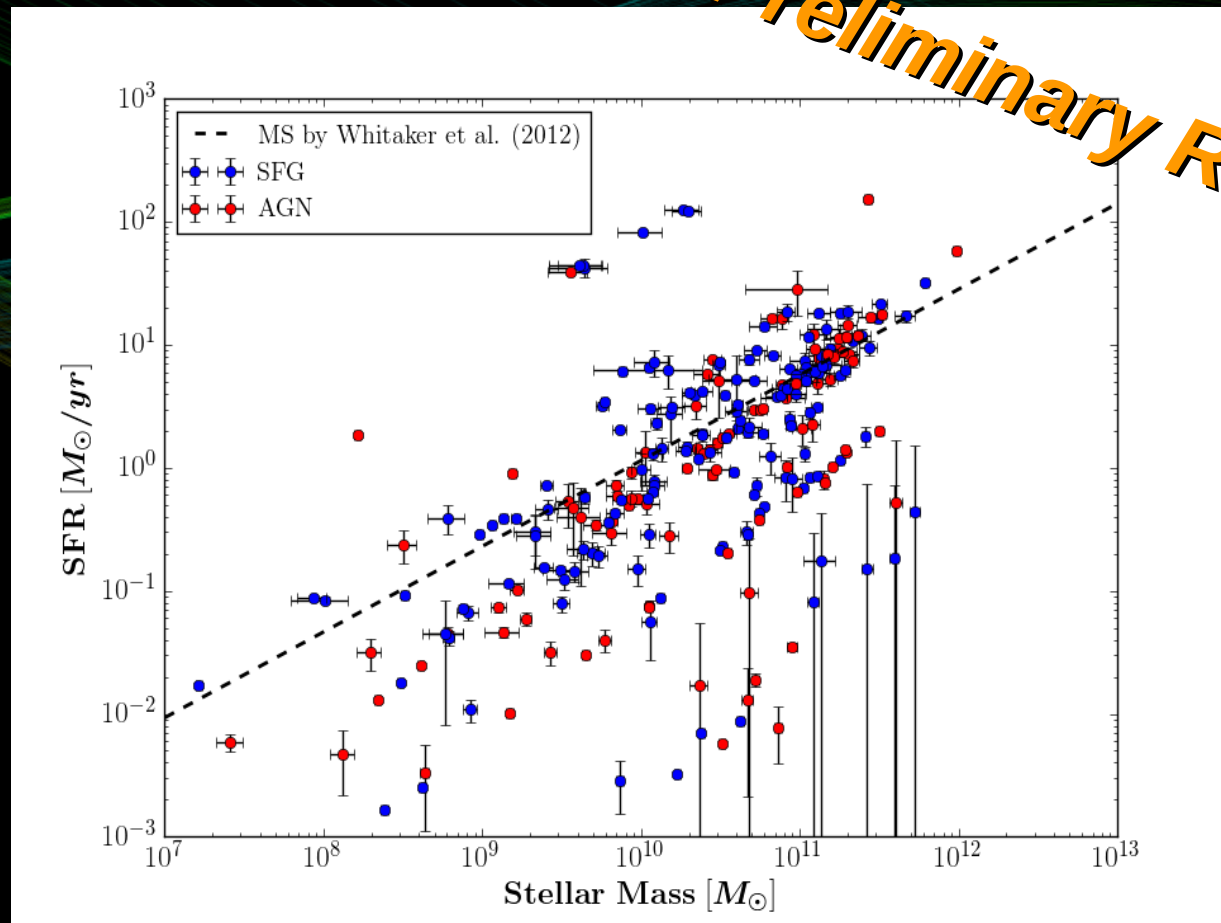


Precision



MS of SFRS galaxies at $z \sim 0.024$

Preliminary Results



Next Steps

- Check the behavior of our results using different SFH scenarios.
- Calibrate the **S – P SED** method using realistic galaxy simulations.
- Use different combinations of spectral regions to optimize the **S – P SED** method.
- Recalculate the bi-variate $s\text{SFR} - M_*$ function of the SFG and AGN – host galaxies.
- Compare results with *STARLIGHT* code.

Summary

- We use a **representative sample** of nearby galaxies to probe the AGN – Star formation connection.
- **Develop accurate methods** to identify activity types.
- Derive the bi-variate sSFR – M_* function for the different activity types.
- Use **Spectro – Photometric** SED fitting method that sets **better constrains** on the derived host – galaxy properties.