Mapping the large scale structure and environmental effects of the star forming galaxies at z~ 1.5 in the DEEP2-3 Field

Ronaldo Laishram[1], Tadayuki Kodama[1], Masao Hayashi(NAOJ), Yusei Koyama(NAOJ) ,José Perez[1], Tomoko Suzuki[1]

1 Tohoku University

Ronaldo Laishram

M2, Tohoku University, Japan

INTRODUCTION

- Galaxies are distributed along large-scale structures

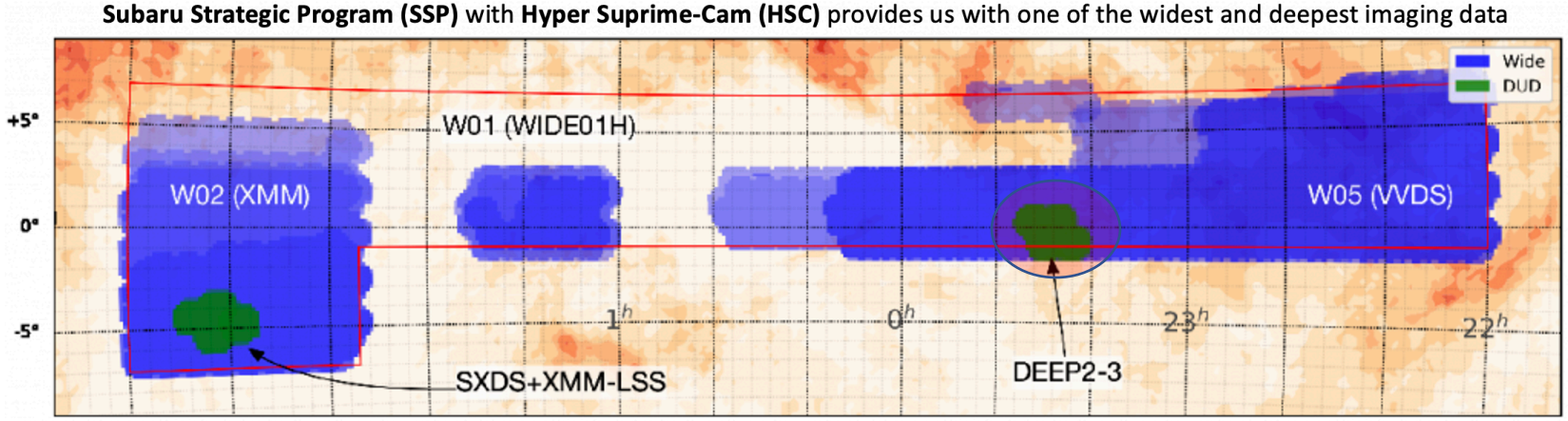
Understanding the evolution of cluster galaxies is to determine precisely how galaxies change their properties as a result of the hierarchical growth of large-scale structures.

Difficulty is the need for accurate determination of the redshift to determine the precise environment of the galaxies.

- Narrowband filters targeting nebular emission from HII regions of star-forming galaxies.
- True 3-D distribution of the galaxies (projected distribution is not real)
- Star forming activity and shape of local galaxies is strongly dependent on environment.

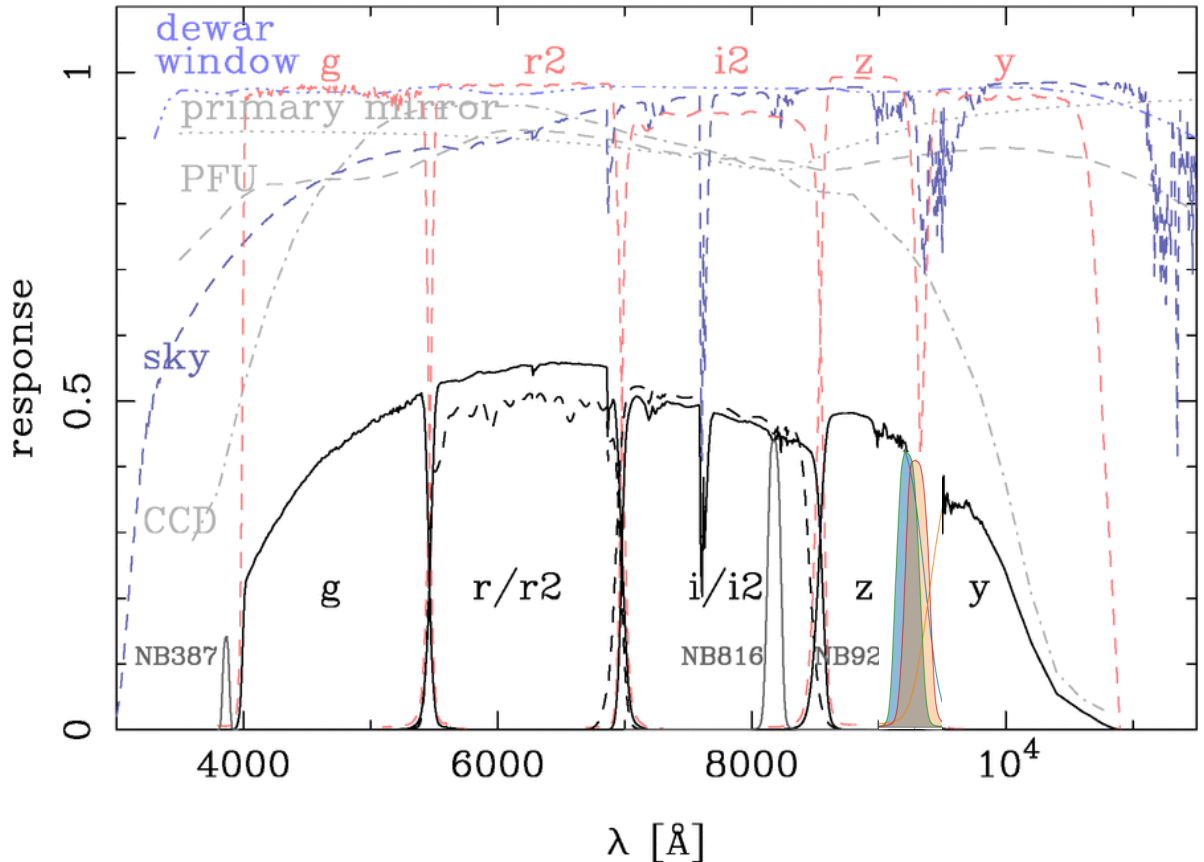
Unveiling star formation activities as a function of both the redshift(when) and environment(where)

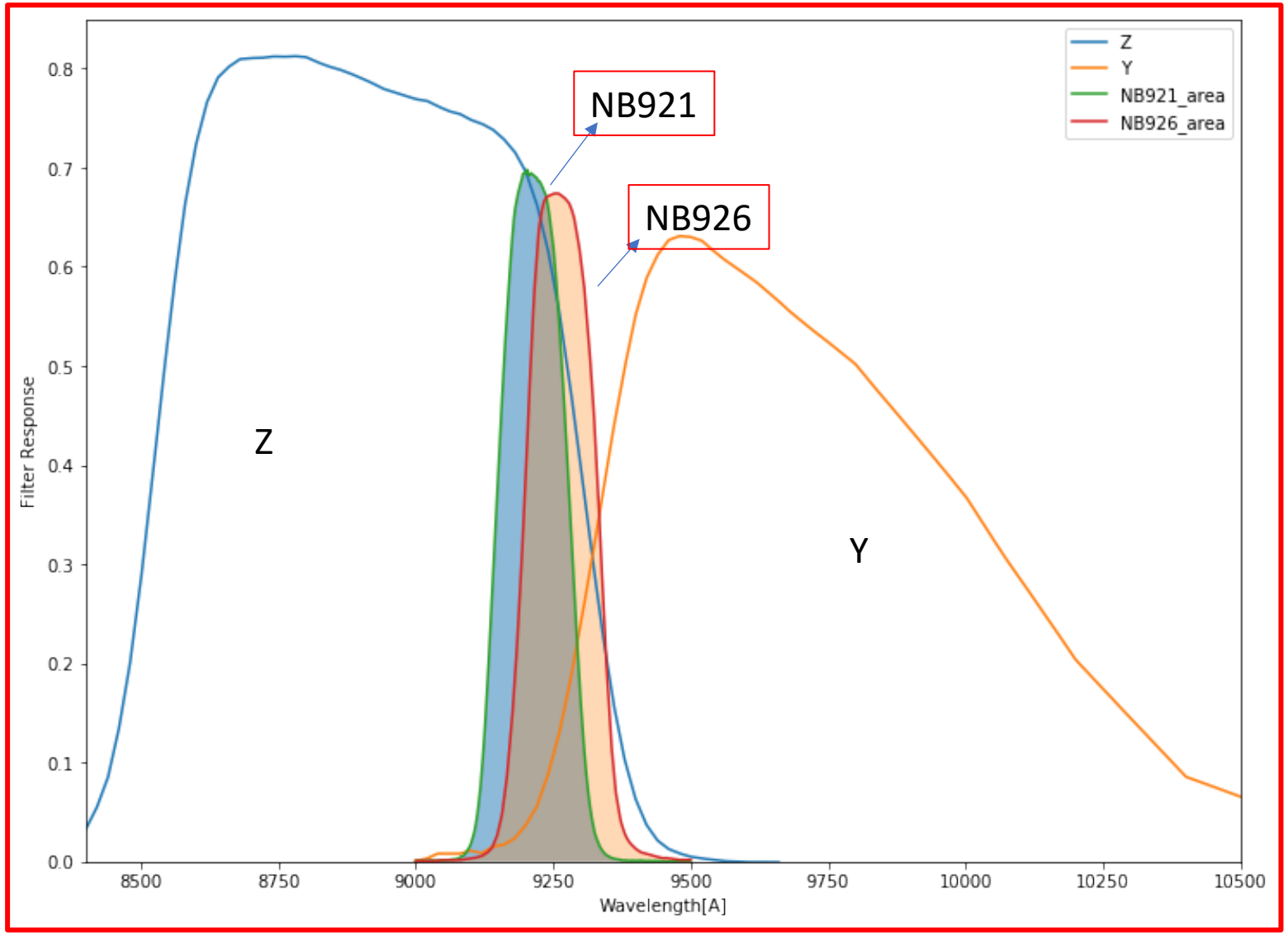
SAMPLE



- DEEP 2-3 Field
- HSC-SSP PDR2 data(Aihara et al. 2019)
- **Spectroscopic data (Hα z~0.41)**
  - Subaru/FOCAS & AAT/AAOmega + 2dF

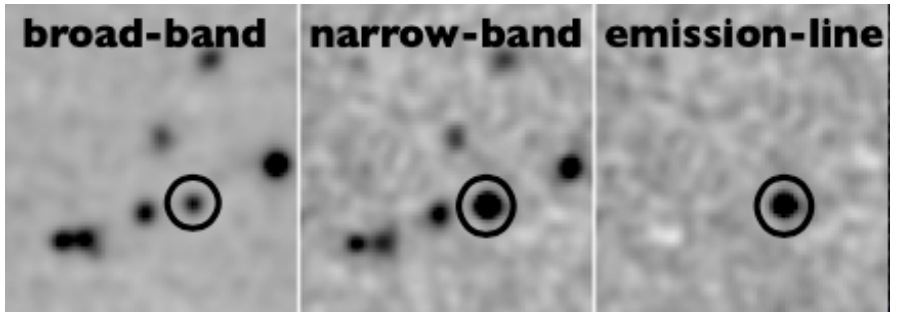
NB921 + NB926
(z &y BB)

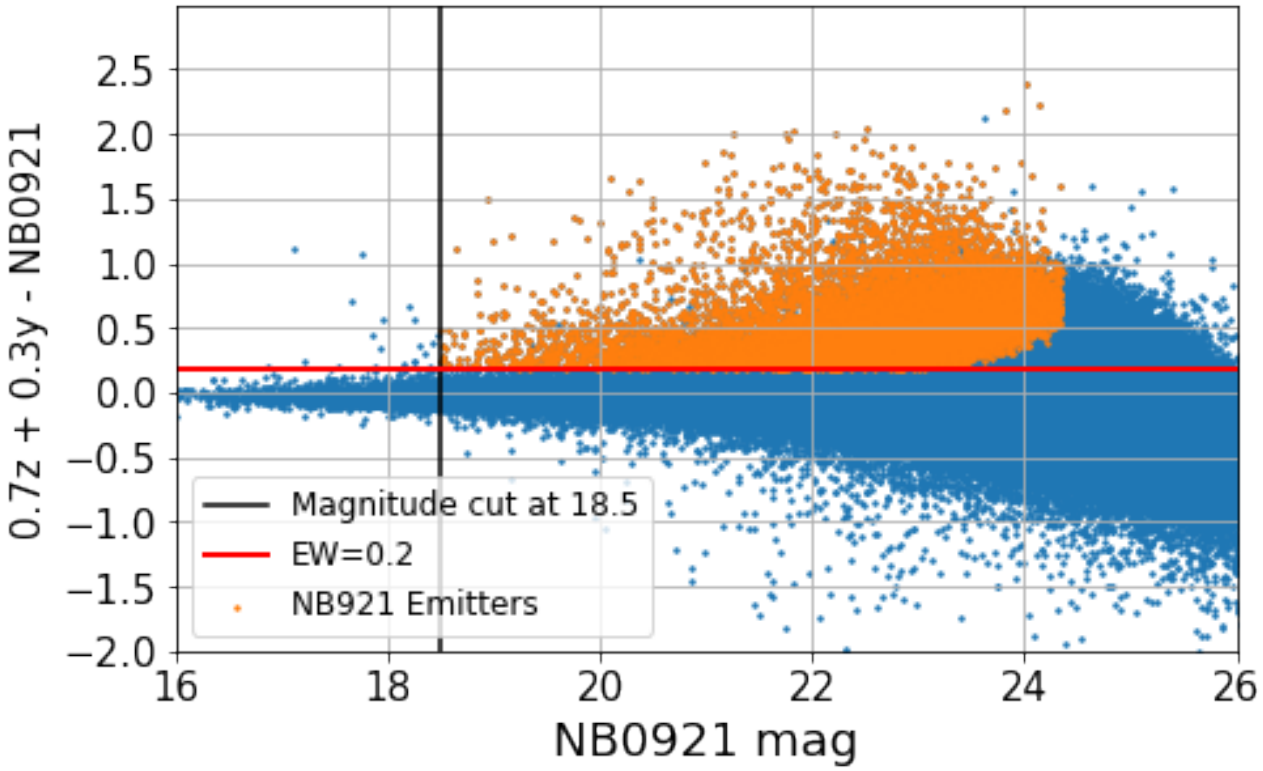


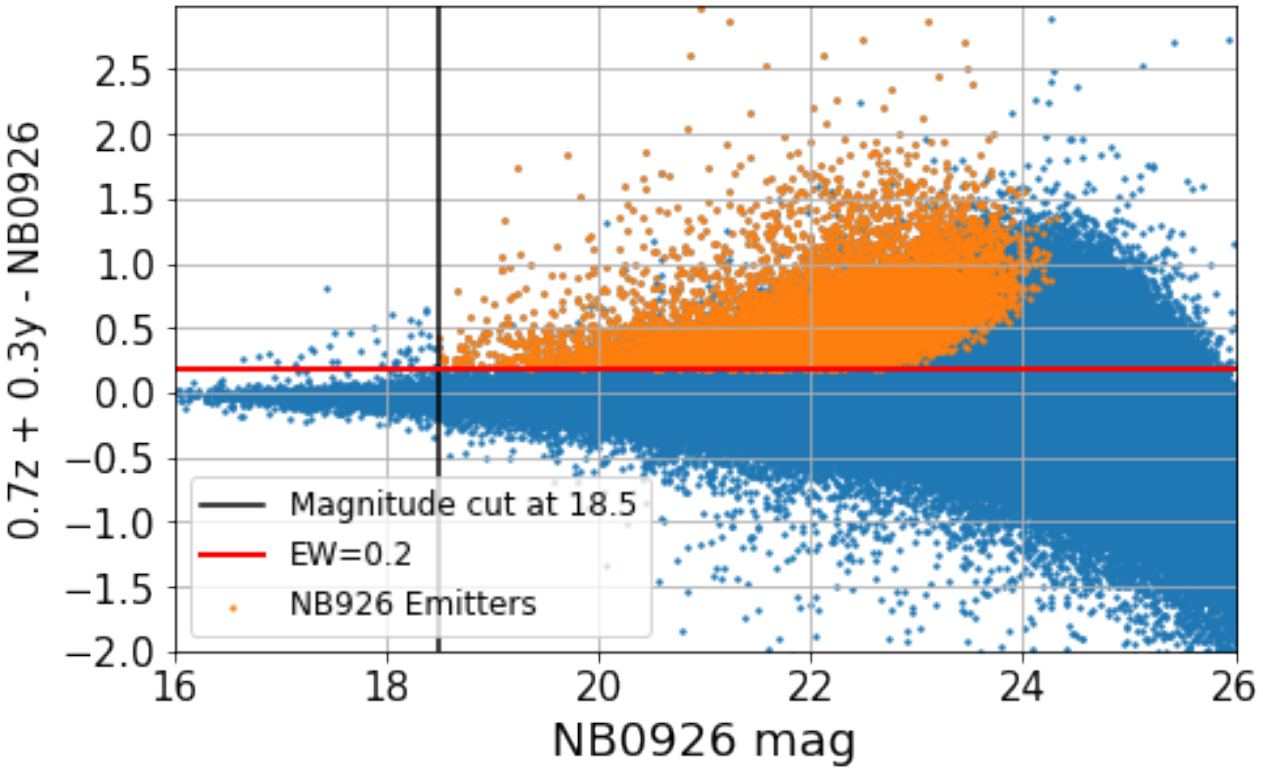


NB921 + NB926
(z &y BB)

Selection of Emission Line Galaxies





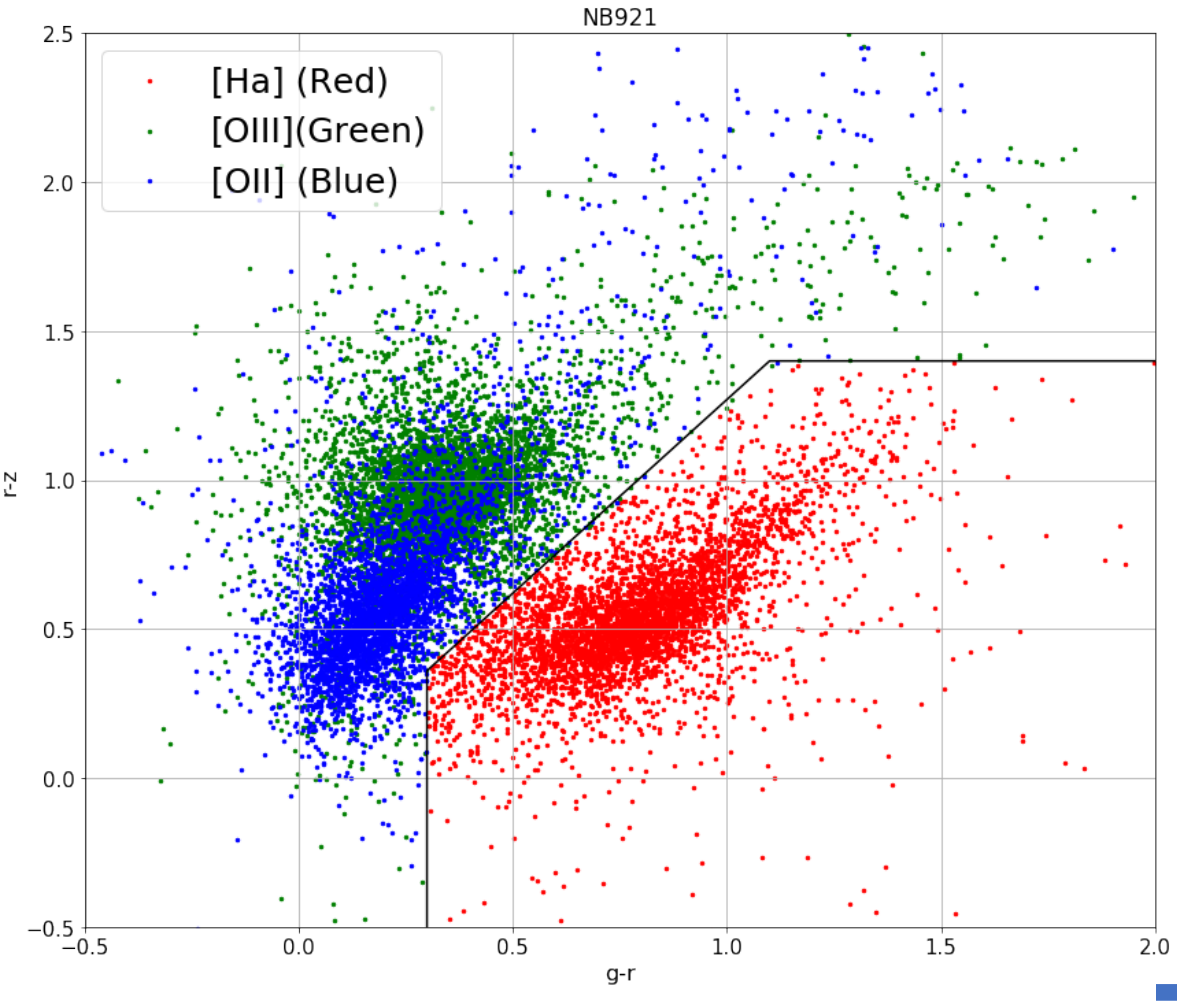


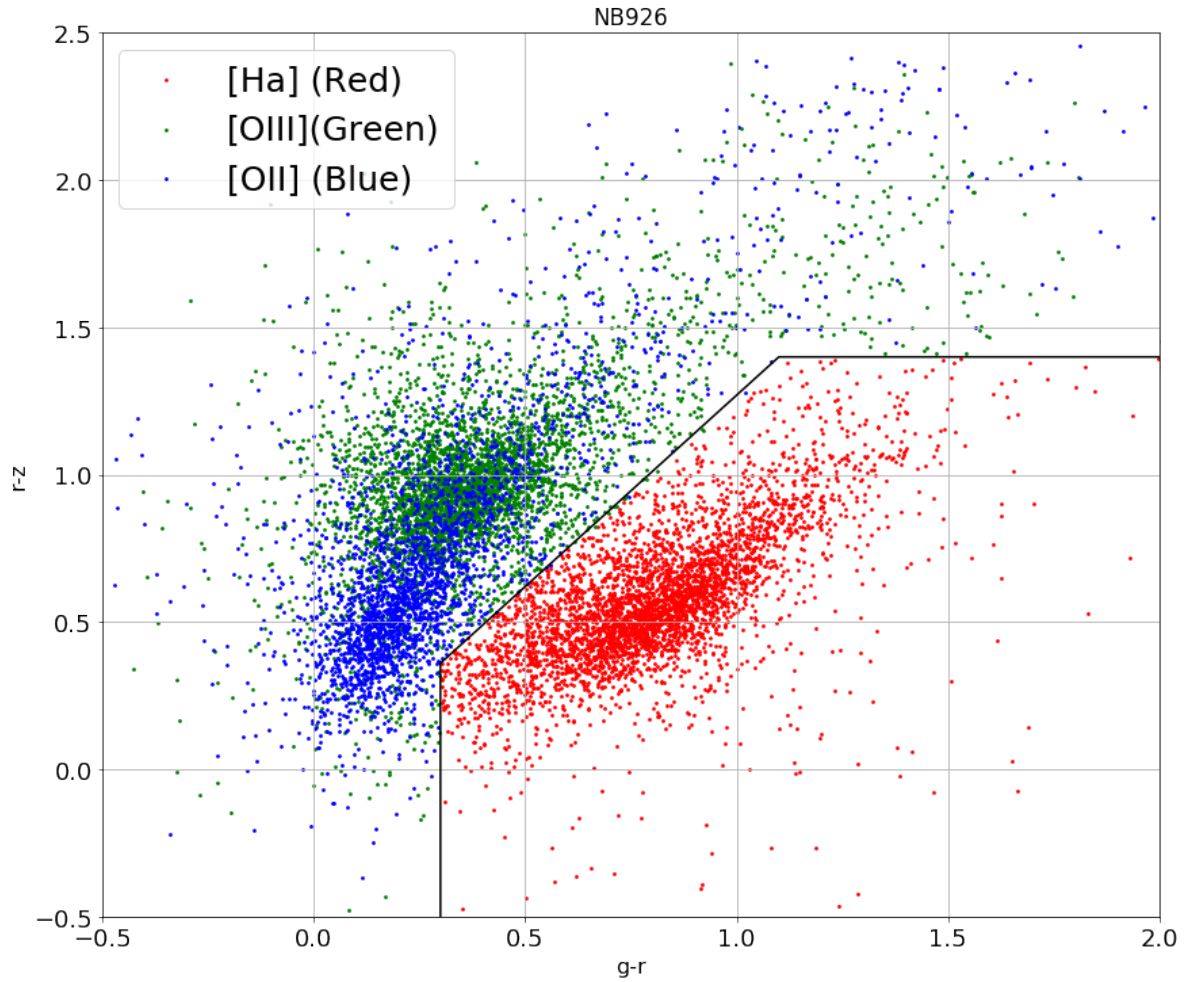
Observed EW > 35Å is applied to exclude possible contamination

Filters used for the selection of emission-line galaxies.

NB	BBs	weights	mag cut	color cut	EW_{obs}
NB921	z, y	0.643, 0.357	>18.5	>0.20	35Å

Color-Color selection to separate **Hα, OII and OIII**





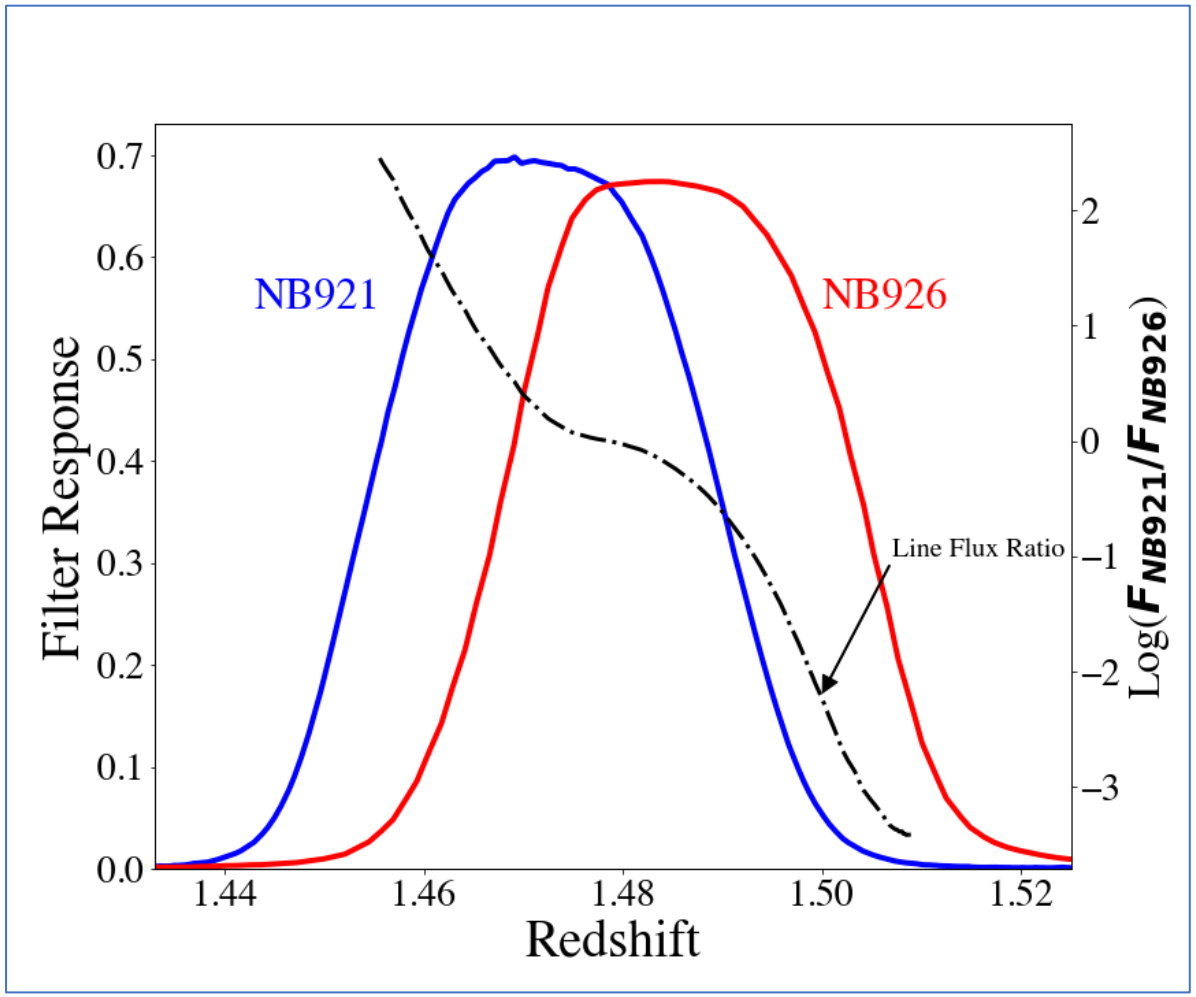
$$r - z \leq 1.4 \wedge g - r \geq 0.3 \wedge r - z \leq 1.24(g - r), \quad (\text{Hα})$$

$$i - y > 1.2 \vee i - y > 1.02(r - i) + 0.15, \quad (\text{OII})$$

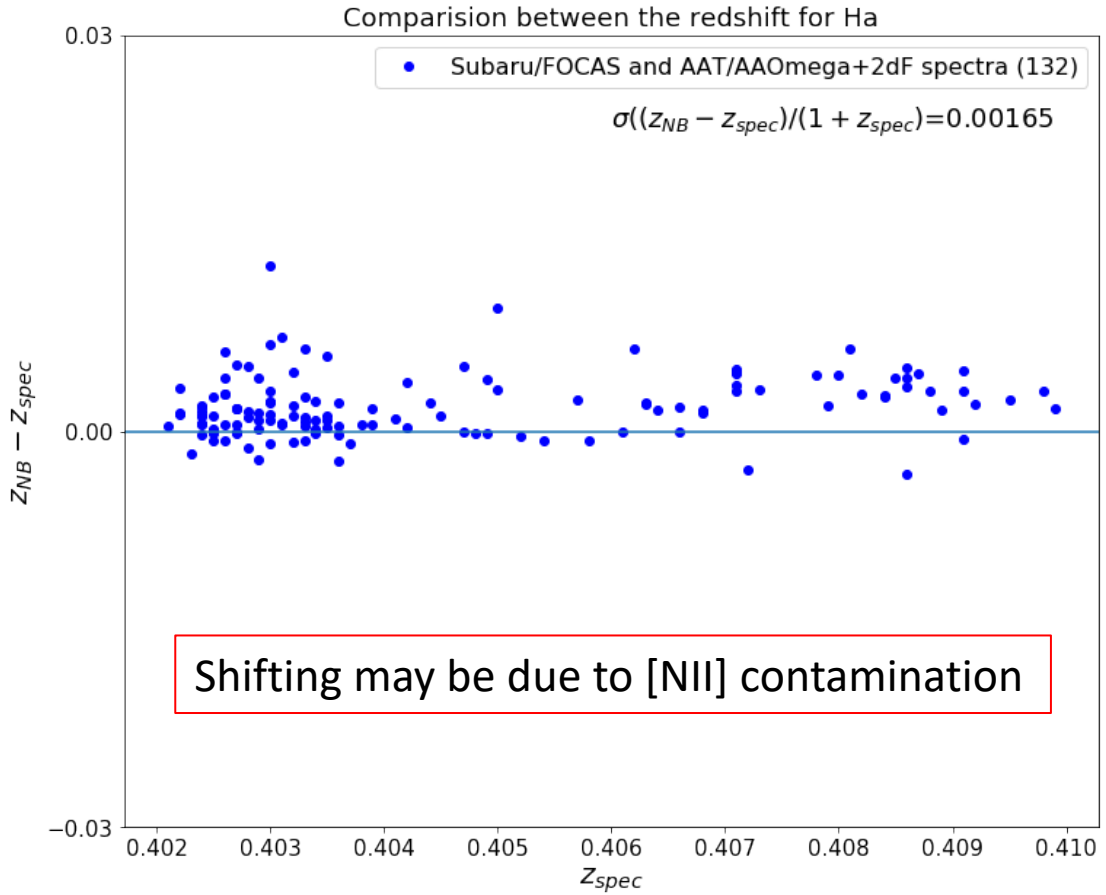
(Hayashi+20)

Common OII Emitters (NB921 + NB926)

REDSHIFT MEASUREMENTS WITH TWO ADJACENT NARROW-BAND FILTERS



Validating the method using **Hα specz**



Shifting may be due to [NII] contamination

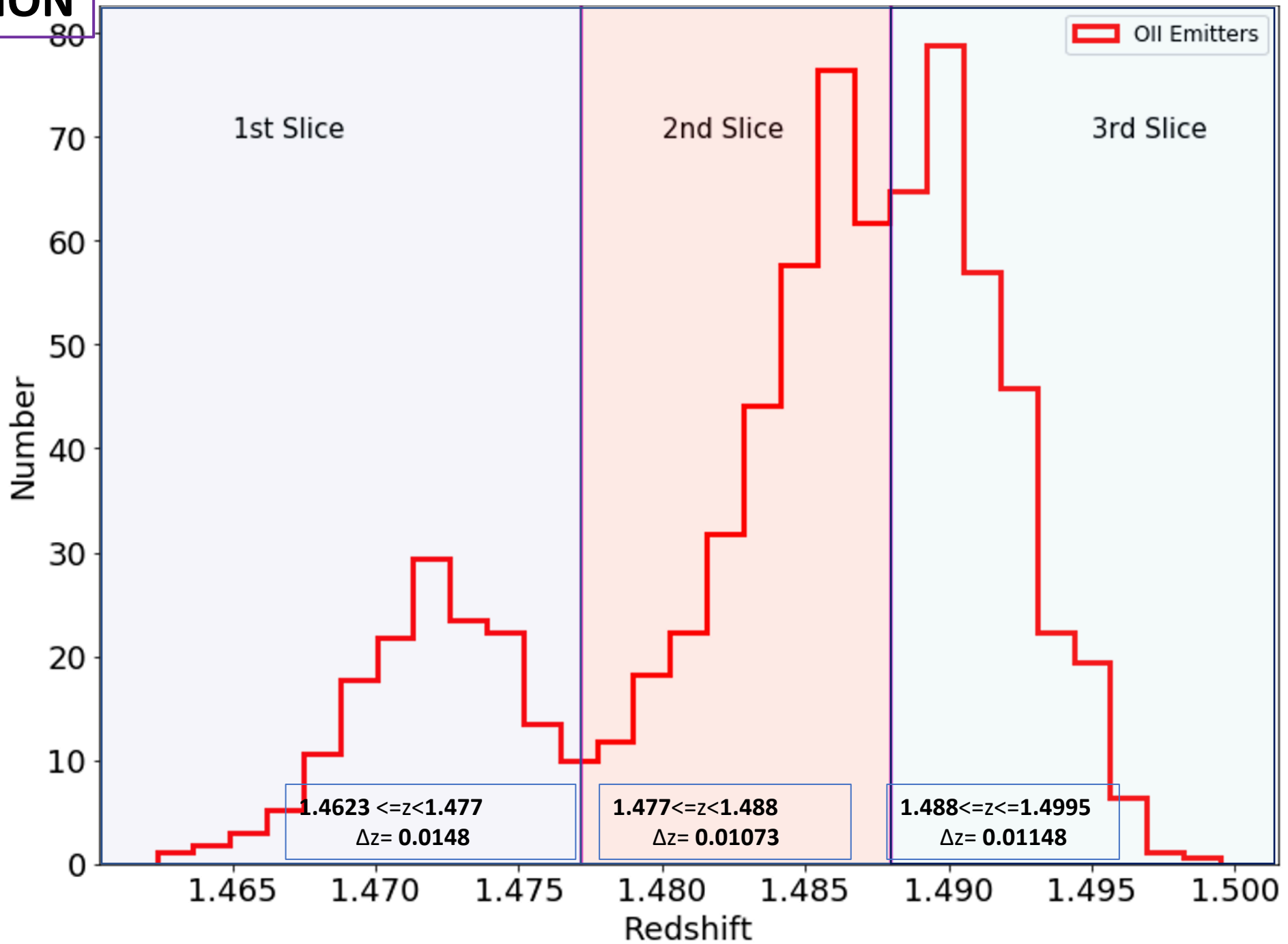
Can measure both accurate fluxes of the emission lines and accurate redshift

❖ The overlap with a slight difference in the response curves allows us to estimate the redshift based on the difference of emission line fluxes measured in the NB921 and NB926 images.

REDSHIFT DISTRIBUTION

Slicing Redshift into 3 parts

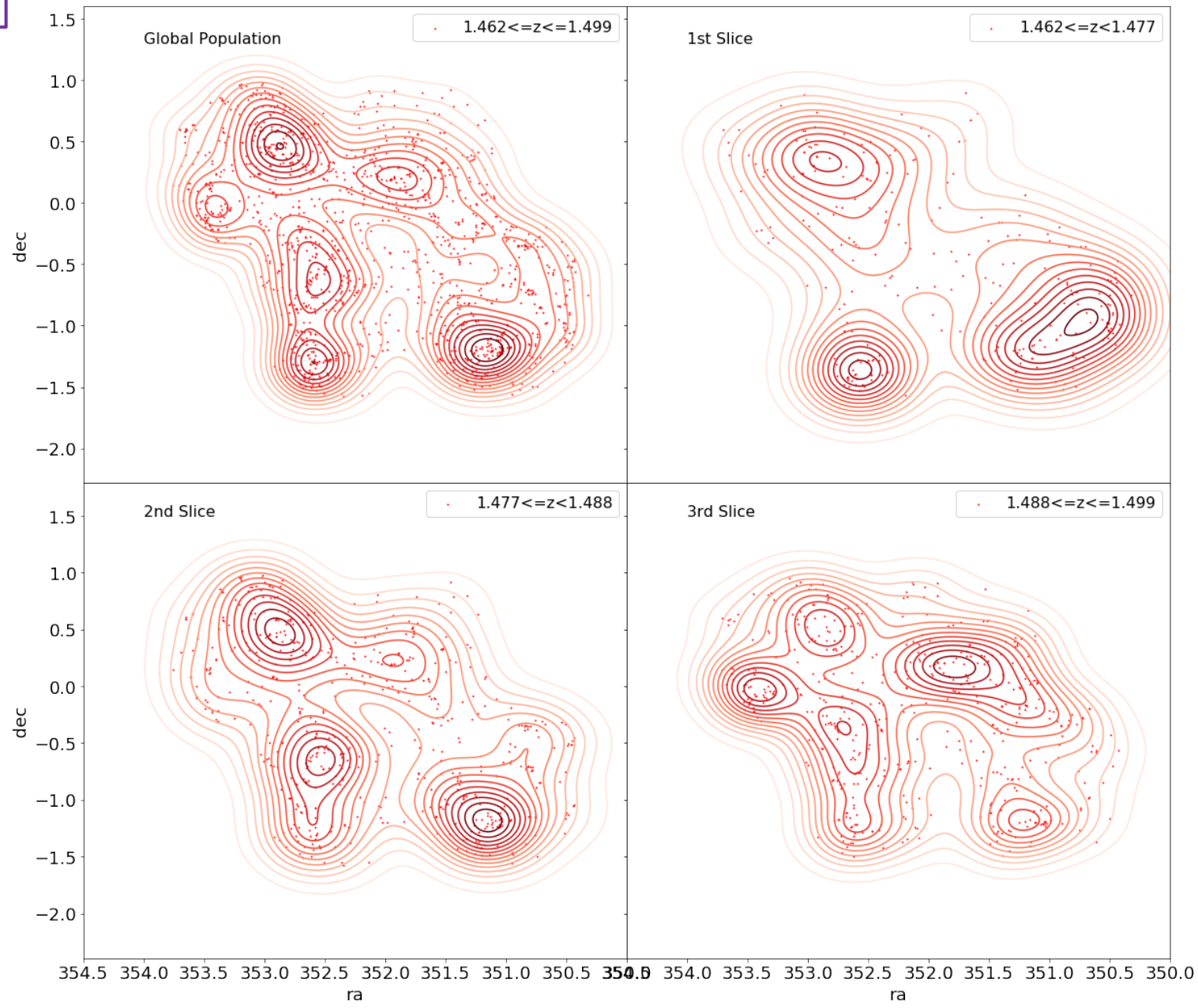
Different Structures In each slice?

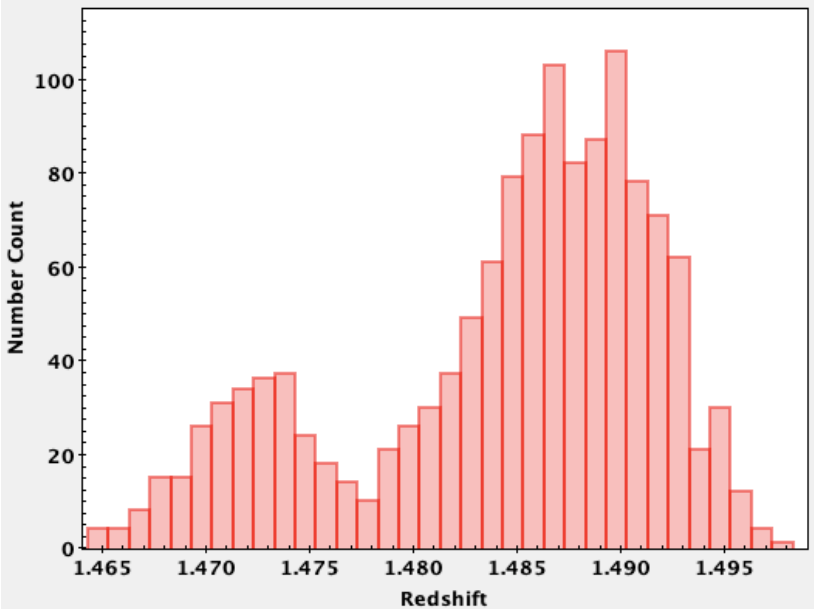


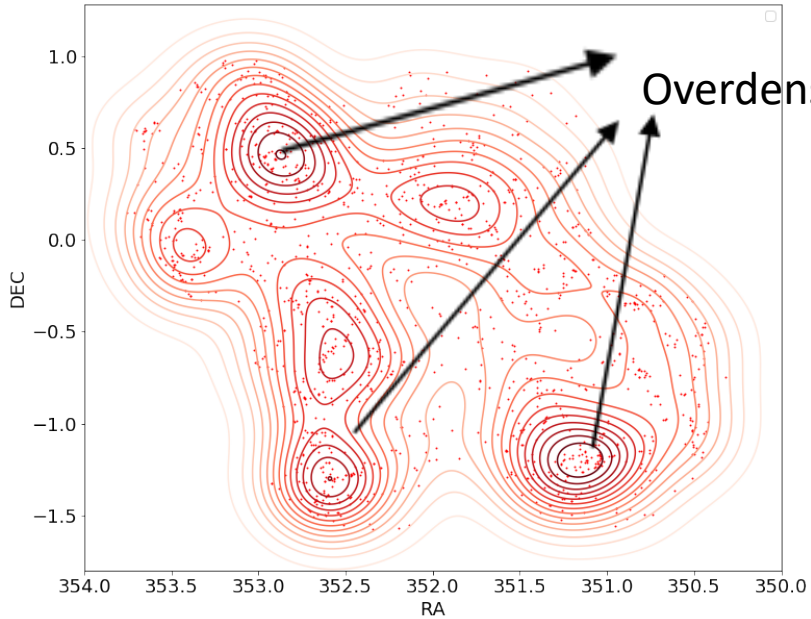
STRUCTURE AT DIFFERENT SLICES

✓ **Different structures in each slices**

Advantages of our novel method




Number Count
Redshift
0
20
40
60
80
100
1.465
1.470
1.475
1.480
1.485
1.490
1.495


Overdensity Region
DEC
RA
1.0
0.5
0.0
−0.5
−1.0
−1.5
354.0
353.5
353.0
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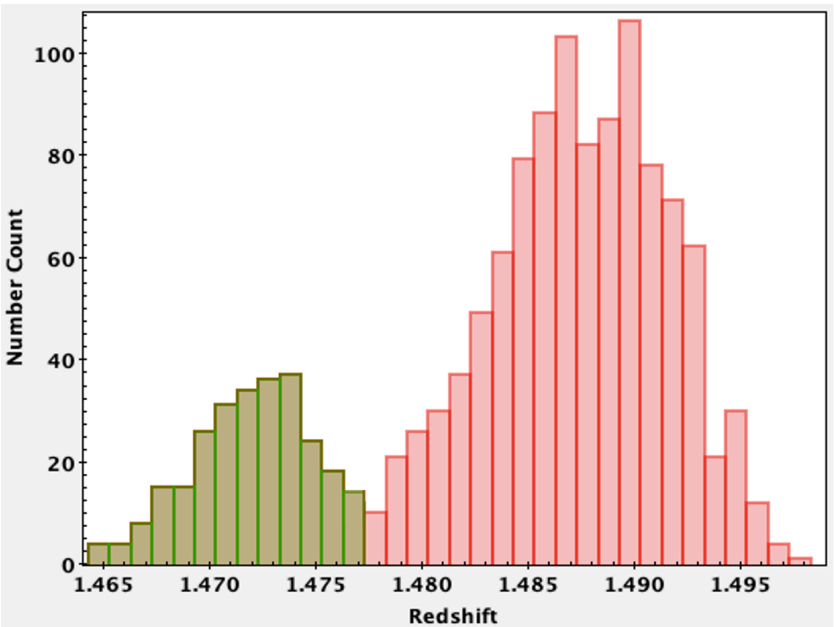
351.0
350.5
350.0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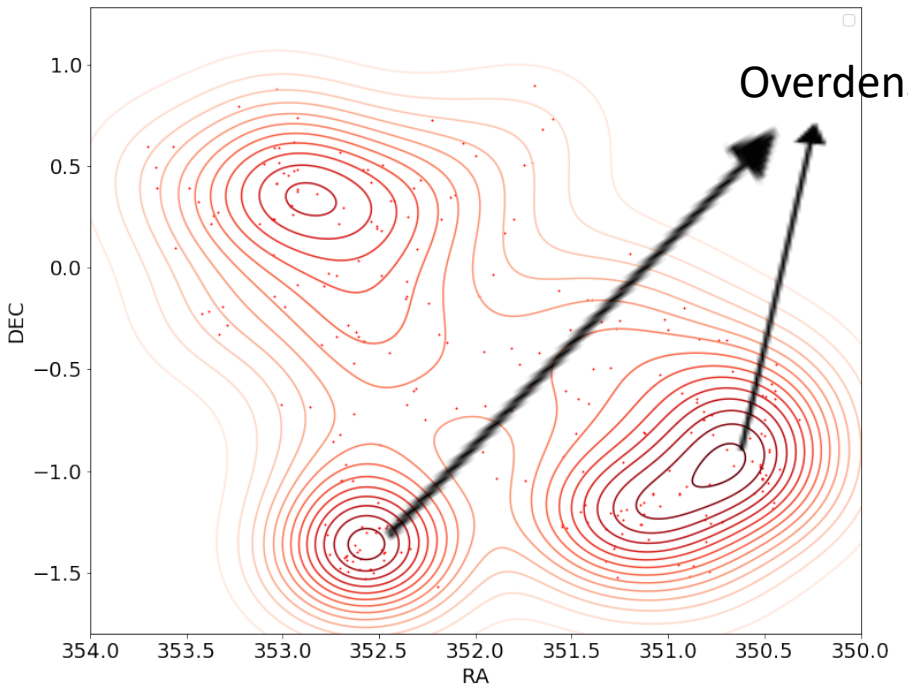
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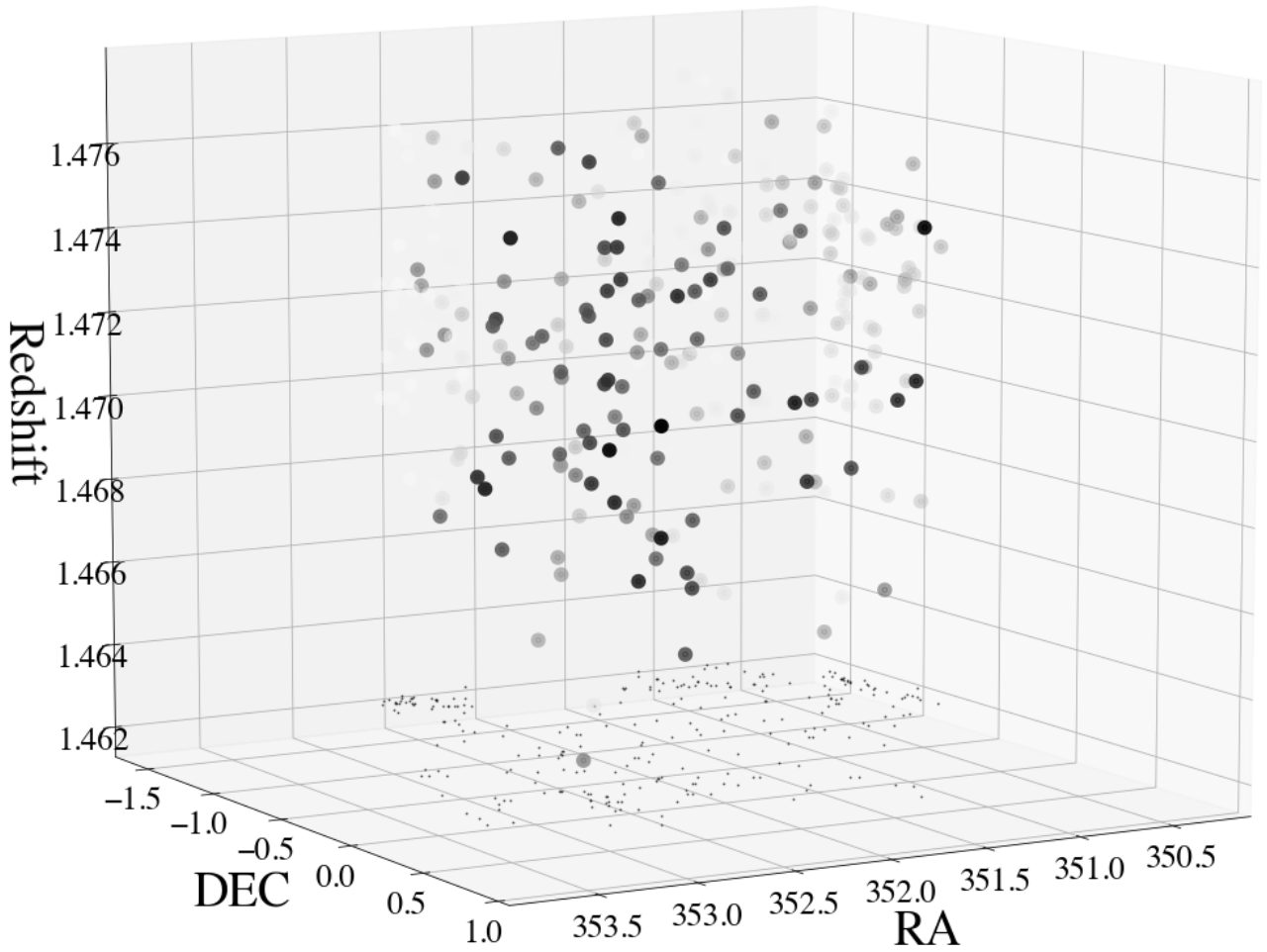
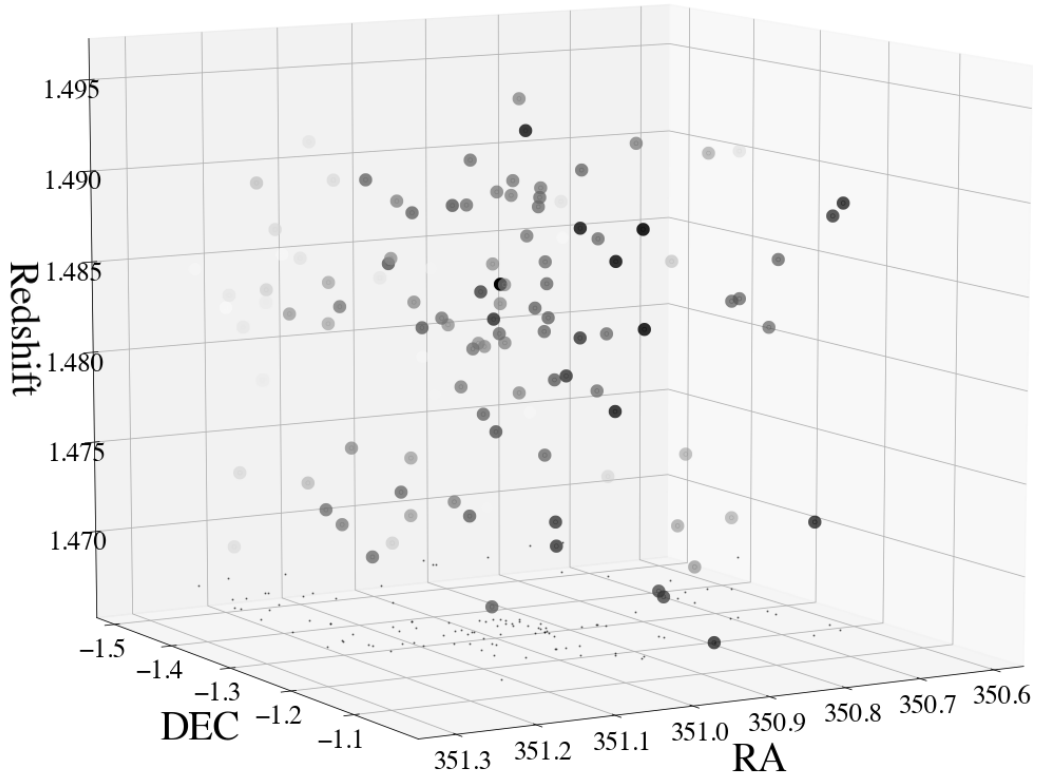
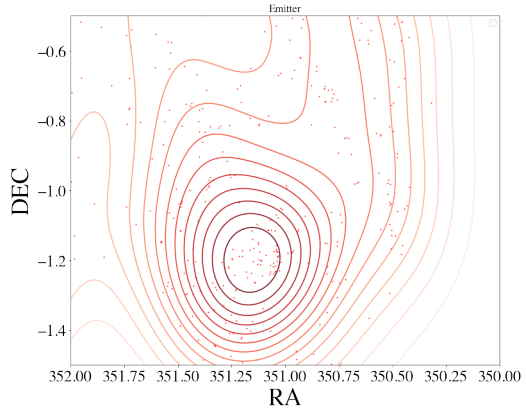
0.5
0.0
−0.5
−1.0
−1.5
354.0
353.5
353.0
352.5
352.0
351.5
351.0
350.5
350.0

Three dimensional distribution





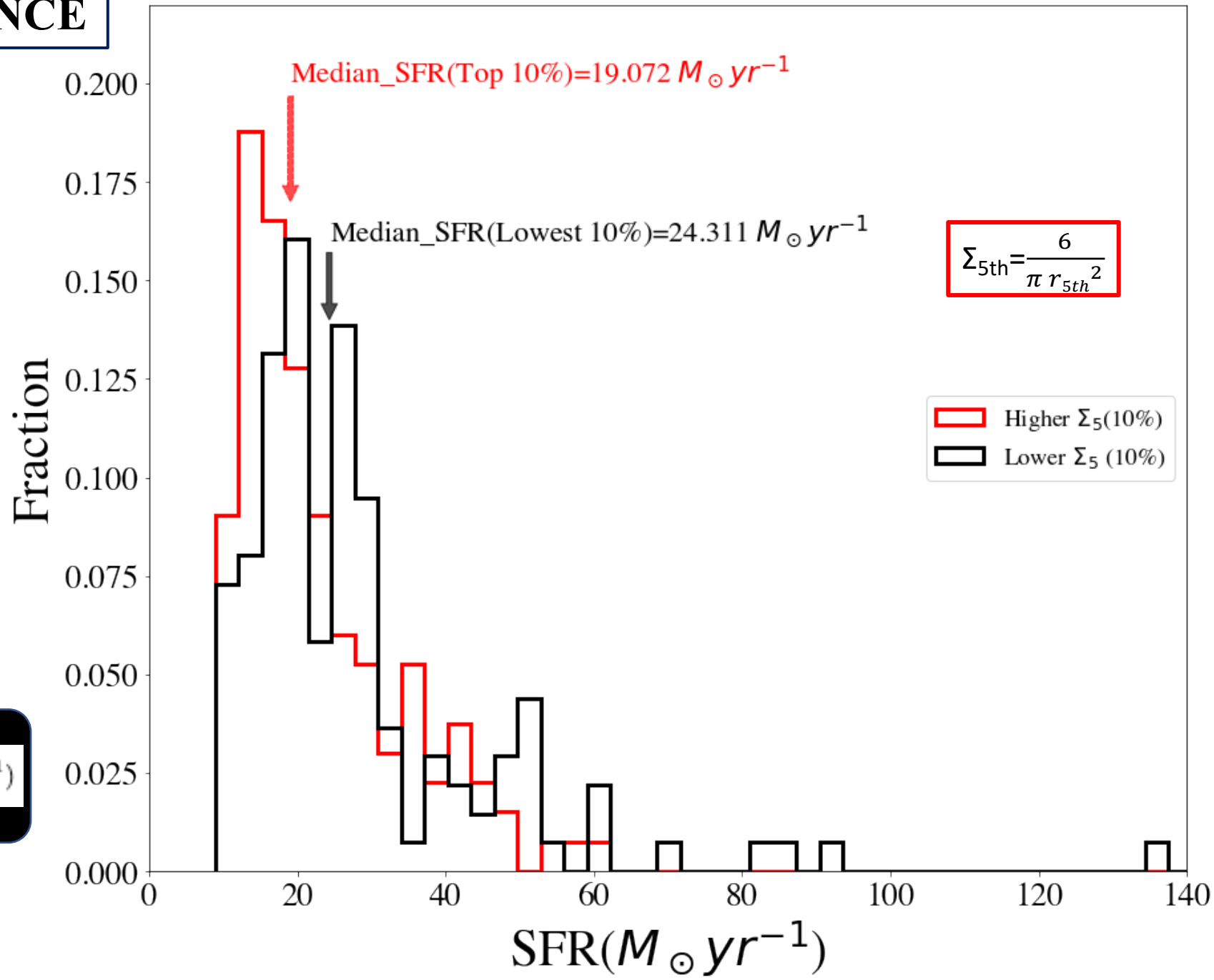


WE CAN SEE THE FILAMENT STRUCTURE USING THIS METHOD

ENVIRONMENT DEPENDENCE

Galaxies in the high density region has less SFR compared to the low density.

$$\mathrm{SFR}(M_\odot \mathrm{year}^{-1}) = (1.4 \pm 0.4) \times 10^{-41}\ L_{[OII]}\ (\mathrm{ergs\,s}^{-1})$$



Summary and Future Work

- Novel method to estimate accurate redshifts and emission line fluxes of SF galaxies
- 3D Mapping and Structure separation at thin redshift slice and reduce the projection effect
- Investigate the environmental dependence of galaxy properties with local density.

- **Environment dependence comparision between the Overdensity region and less-dense region.**
- **Comparing the properties with Hα(z~0.41) and OIII(z~0.86) emitters**
- **Obtaining the spectroscopic data of the sample**