

# Machine learning classification of the ISM in NGC 300

Asier Castrillo



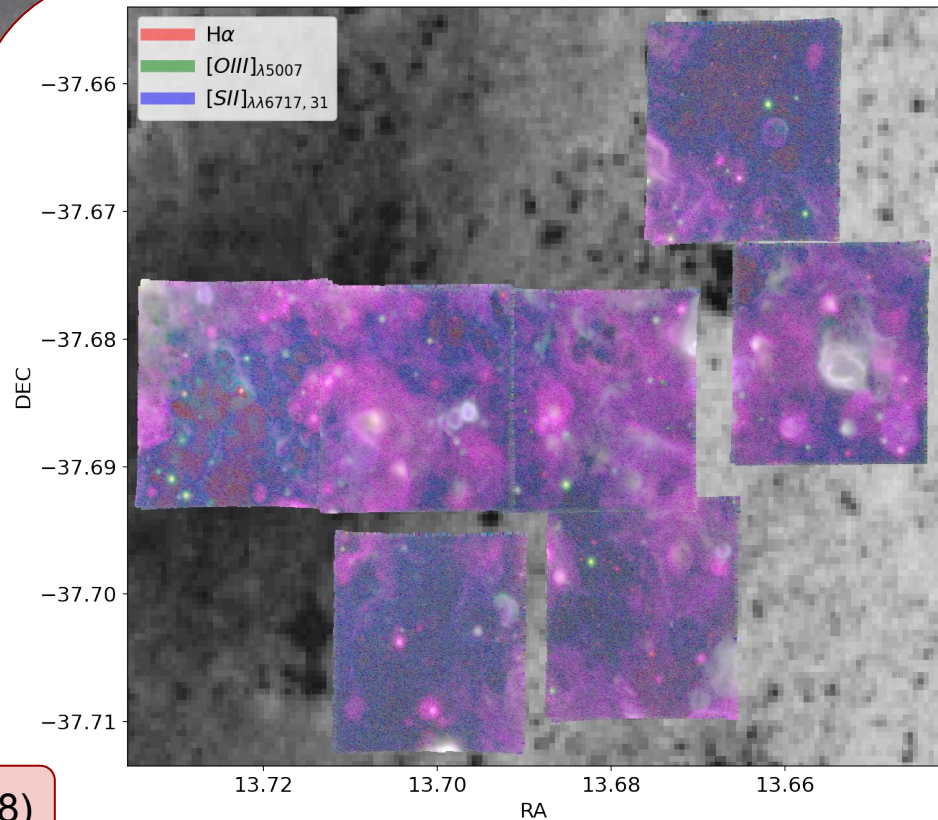
# Machine learning classification of the ISM in NGC 300

We are looking for SNR in NGC 300

NGC 300 is 1.88 Mpc away.

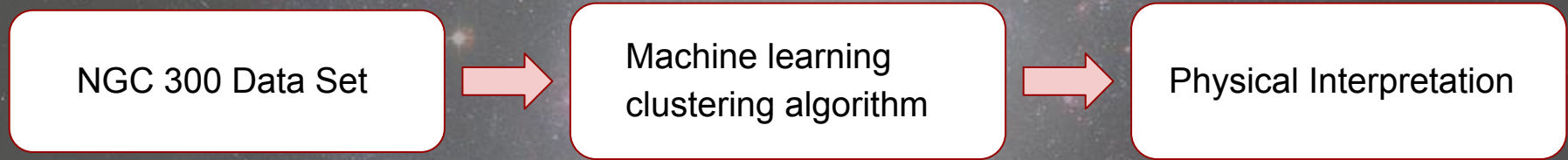
Resolve scales at MUSE spatial resolution.

We see a complex ISM structure.



Roth et. al. (2018)

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NGC 300 Data Set

Emission lines

H $\beta$  , H $\alpha$   
[OIII]  $\lambda\lambda$  4959, 5007  
[NII]  $\lambda\lambda$  6548, 84  
[SII]  $\lambda\lambda$  6717,31

spaxel-by-spaxel

Normalization

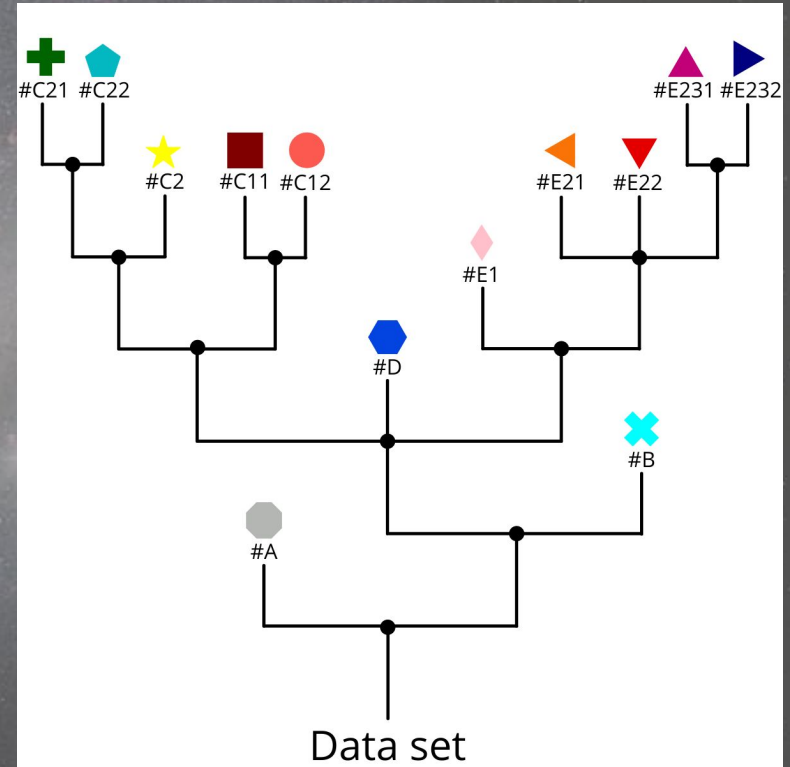
$$F = \frac{\text{Log}(f)}{\text{Max}(\text{Log}(f))}$$

# Machine learning classification of the ISM in NGC 300

Machine learning  
clustering algorithm

Unsupervised Bayesian  
Gaussian Mixture Model

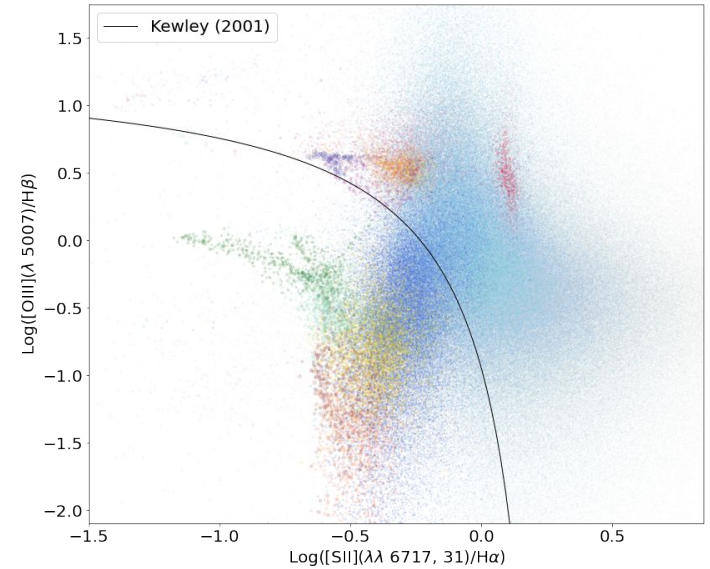
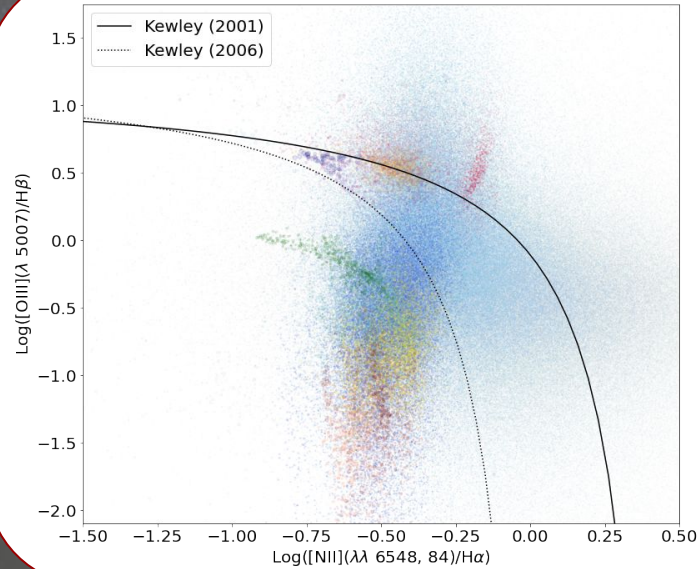
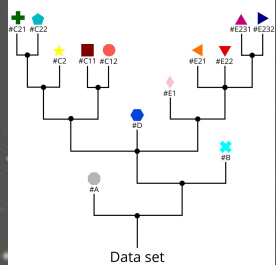
Tree scheme



# Machine learning classification of the ISM in NGC 300

## Physical Interpretation

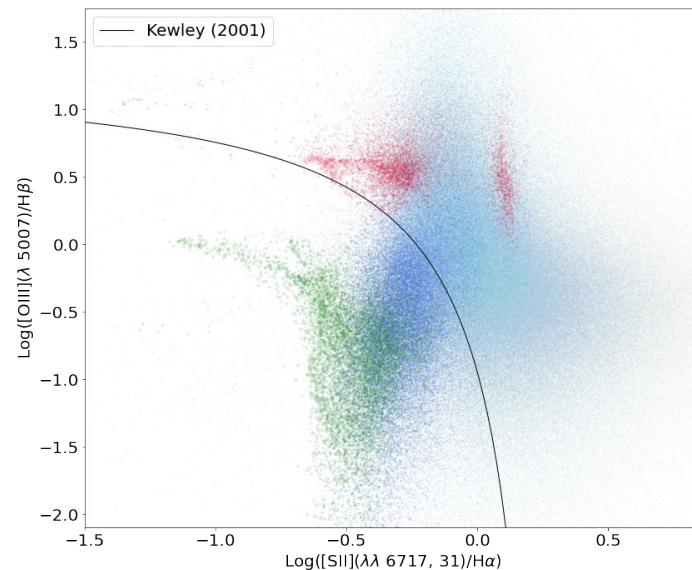
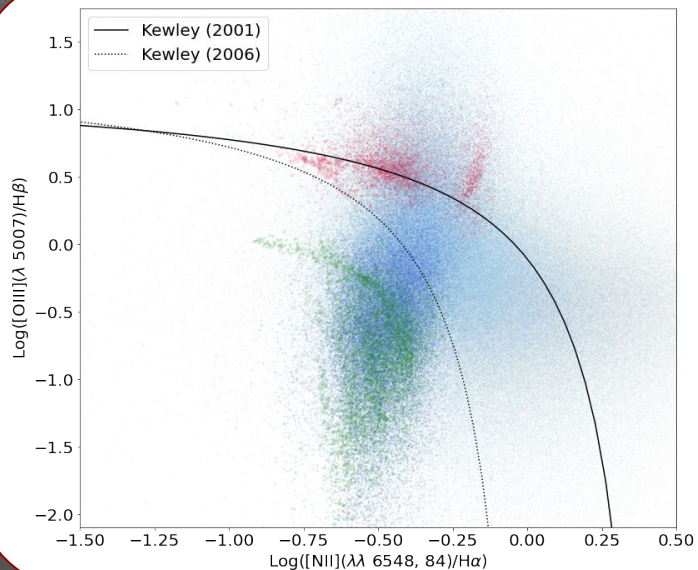
## Diagnostic diagrams



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## Physical Interpretation

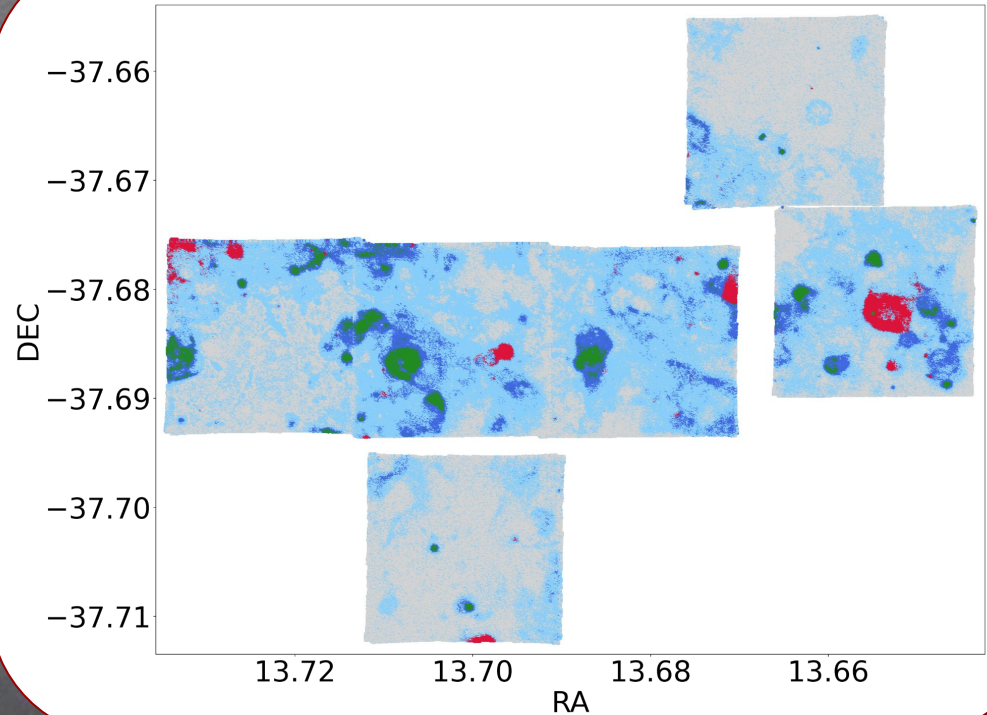
## Diagnostic diagrams



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Physical Interpretation

Spatial distribution





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## Object catalog

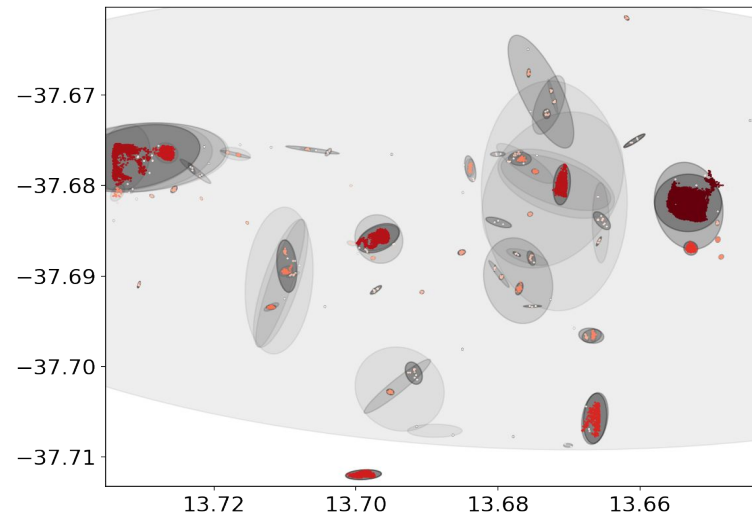
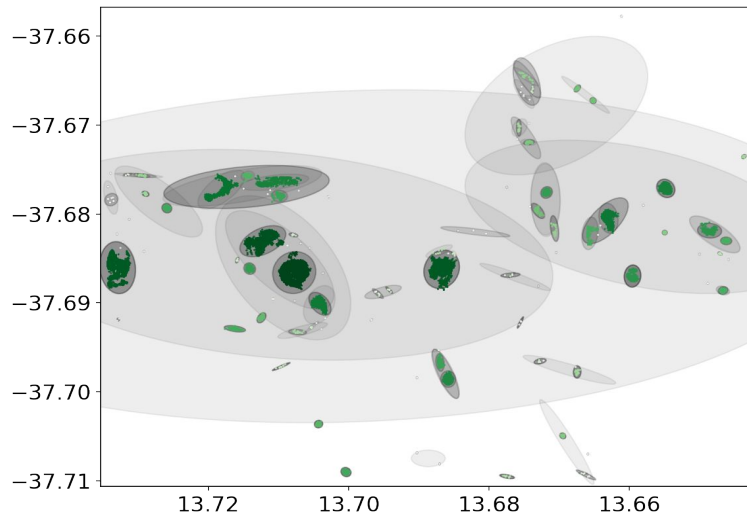
### BDSCAN

Density-Based Spatial Clustering of  
Applications with Noise

### Tree scheme

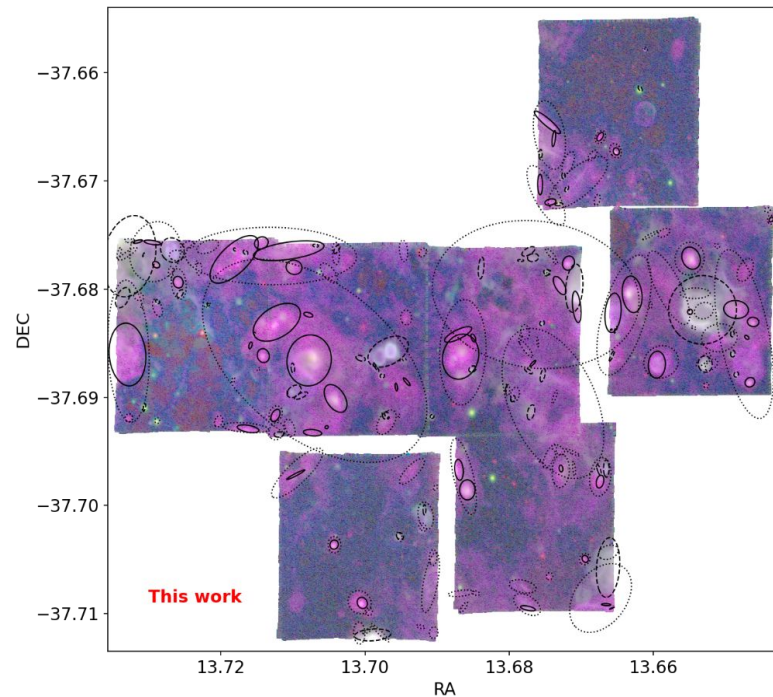
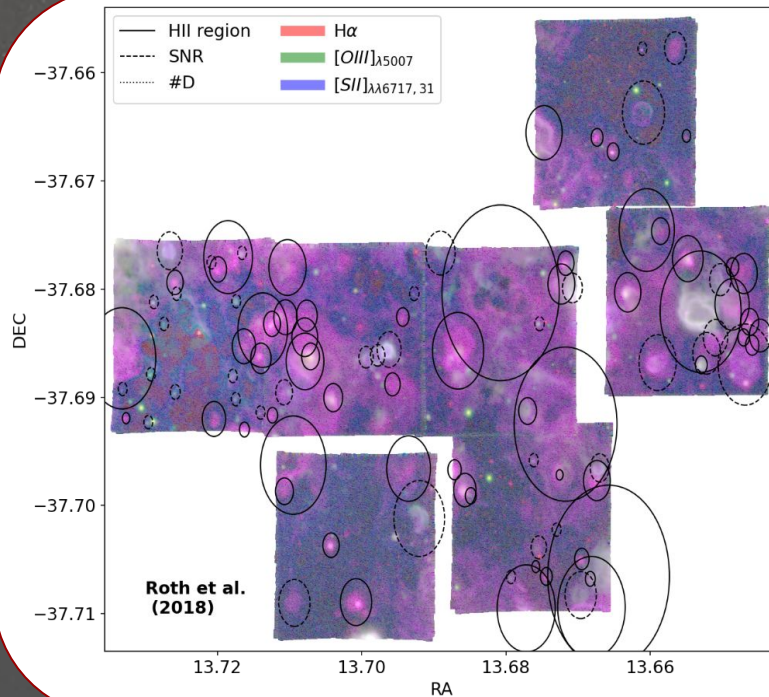
## HII region

## SNR



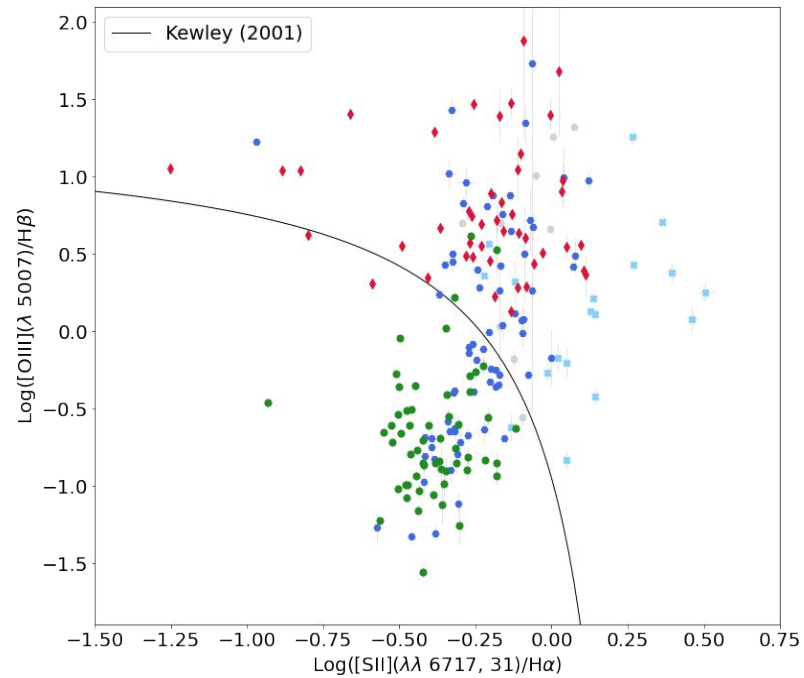
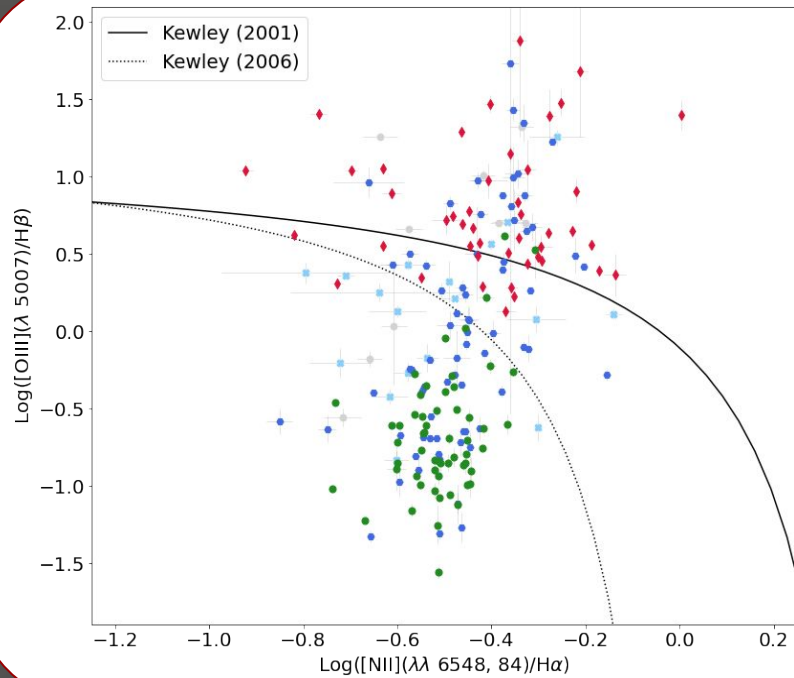
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## Catalog comparison



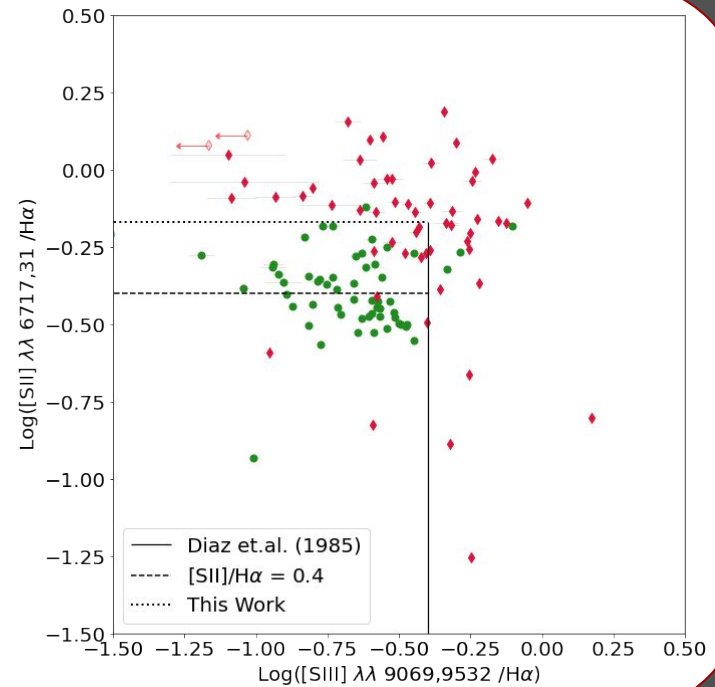
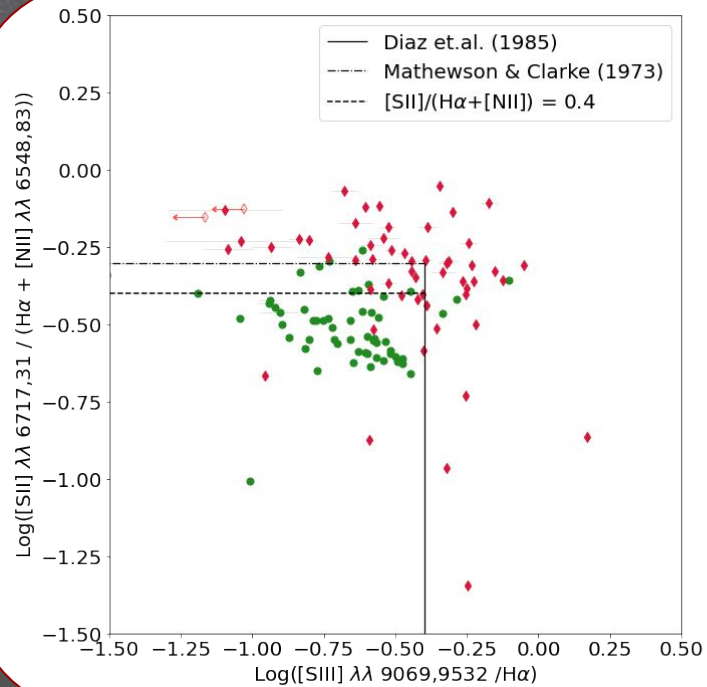
# Machine learning classification of the ISM in NGC 300

## Diagnostic diagrams



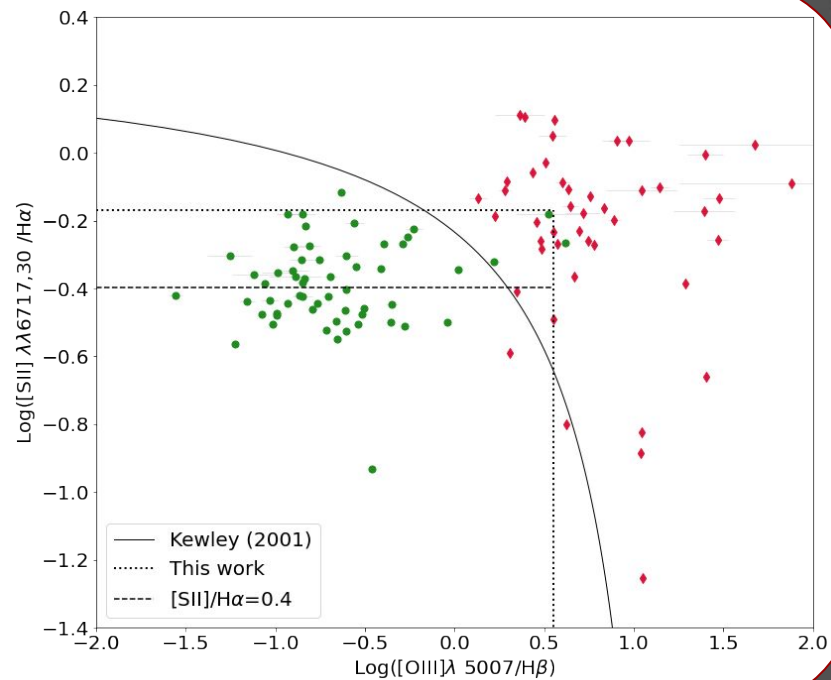
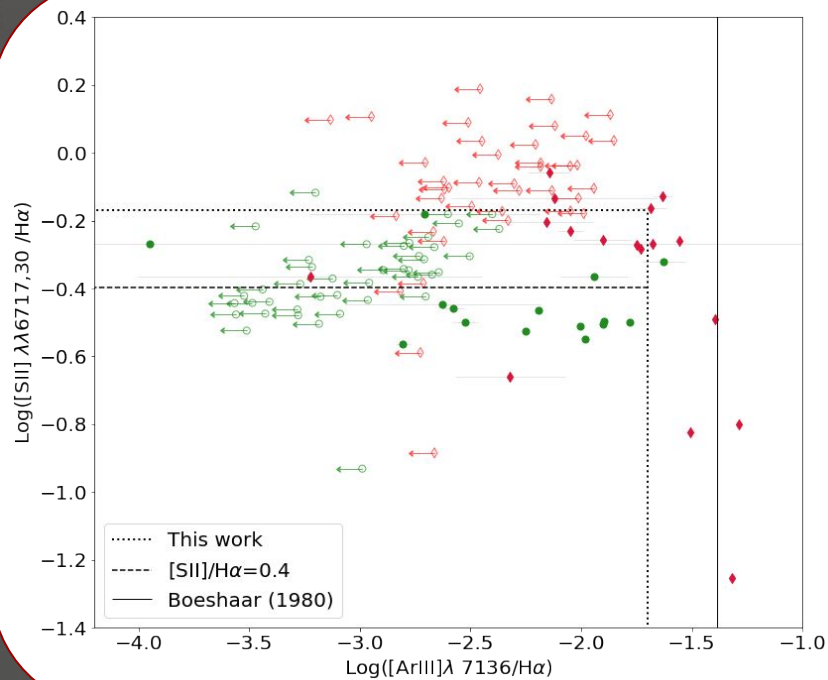
# Machine learning classification of the ISM in NGC 300

## Diagnostic diagrams



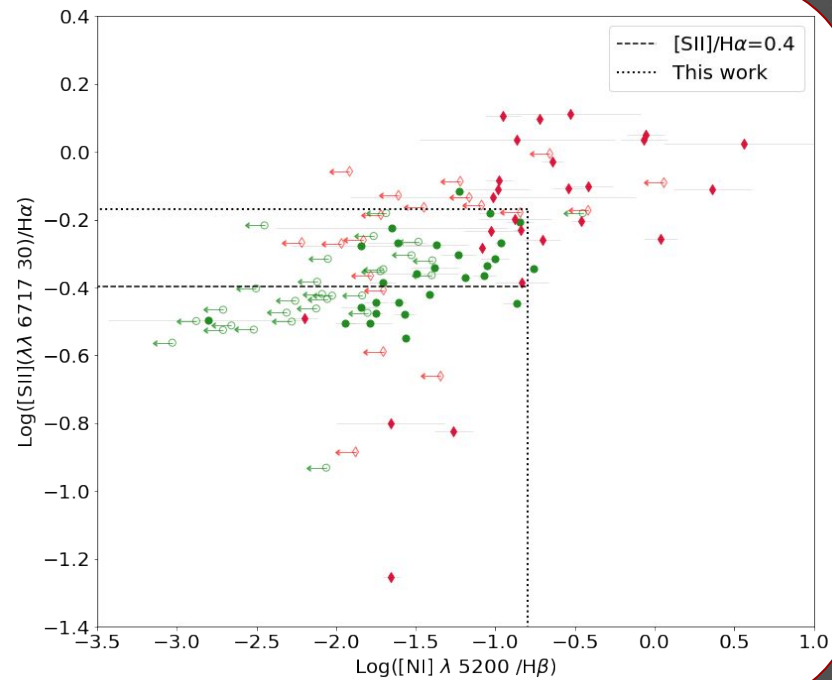
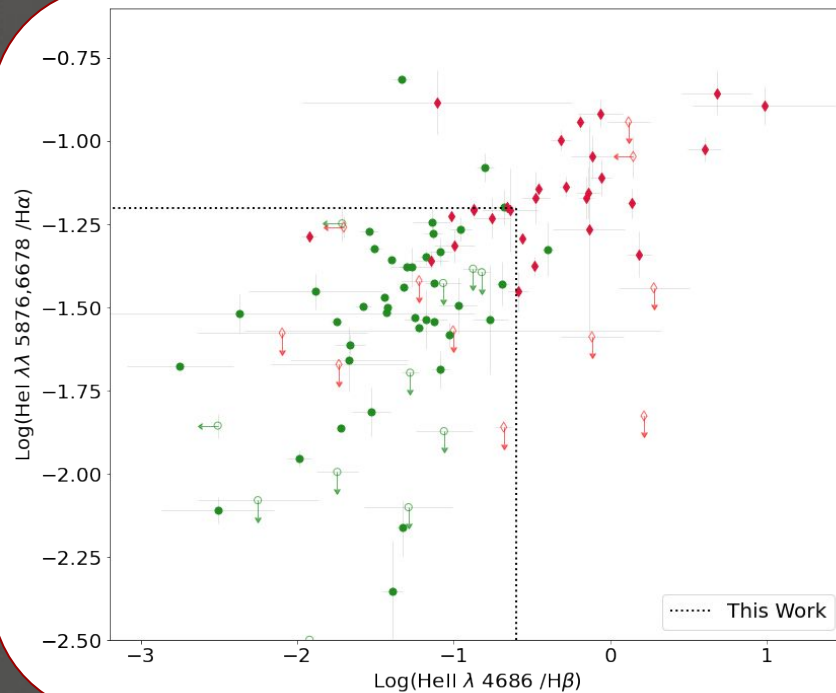
# Machine learning classification of the ISM in NGC 300

## Diagnostic diagrams



# Machine learning classification of the ISM in NGC 300

## Diagnostic diagrams



# Machine learning classification of the ISM in NGC 300

## To take away

- Machine learning methods are just another tool.
- We found 57 HII region, 56 SNR and 109 diffuse regions.
- Not all that glitters (in Ha), is gold (HII region). The SNR and the DIG contribution can affect your line coefficients.



# Machine learning classification of the ISM in NGC 300

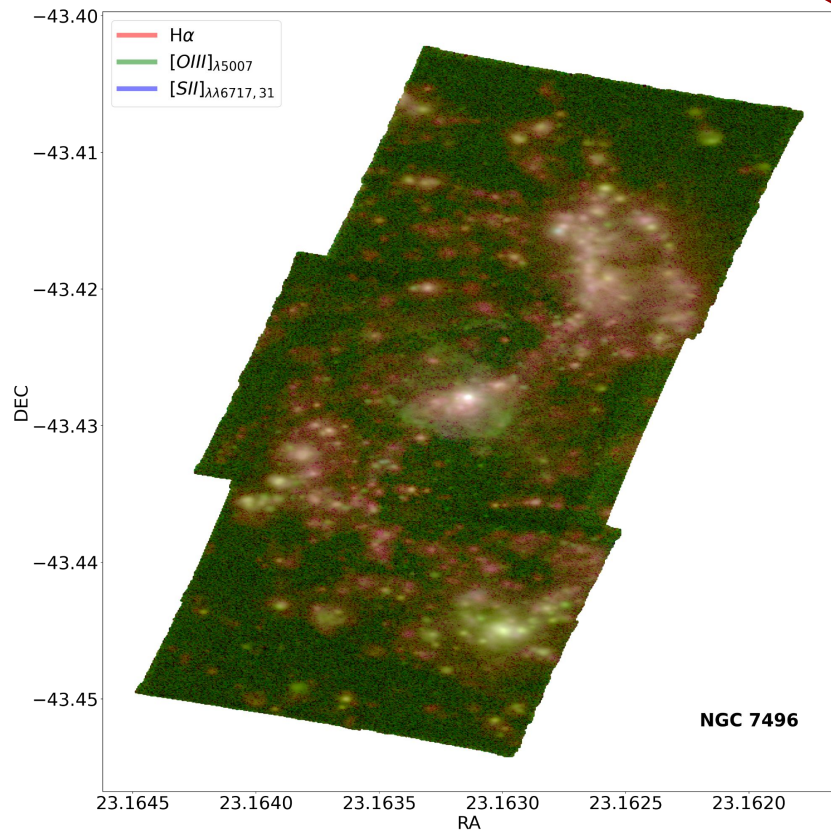
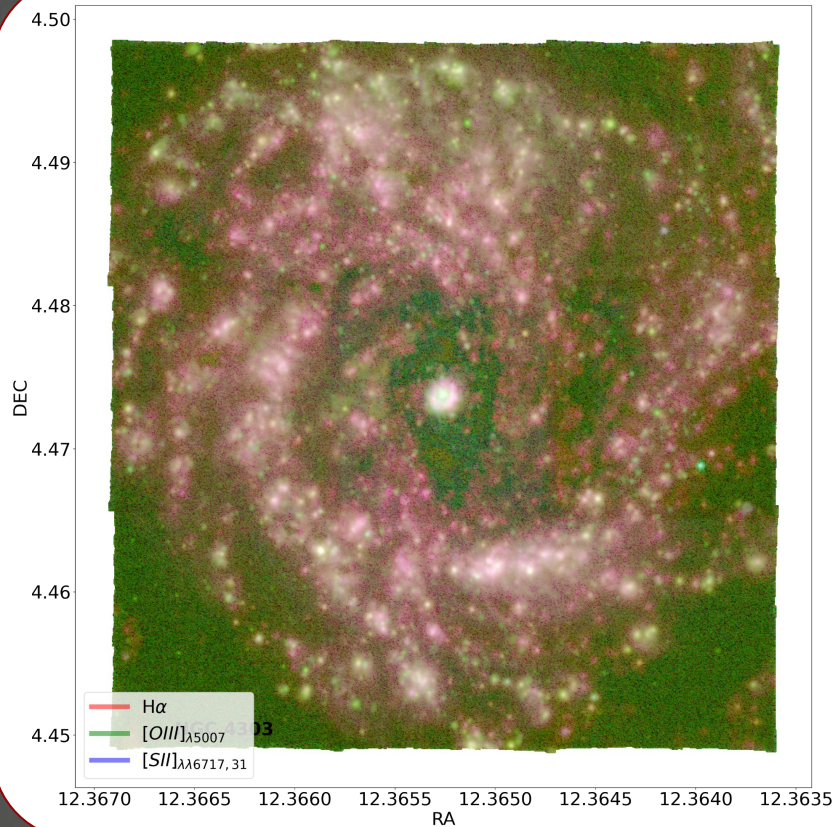
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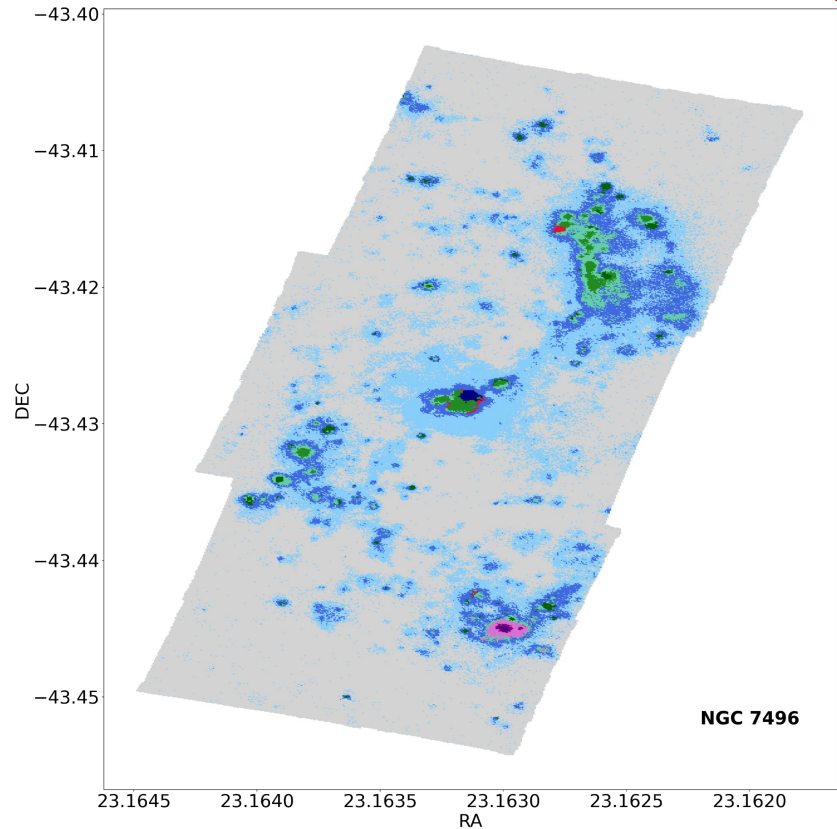
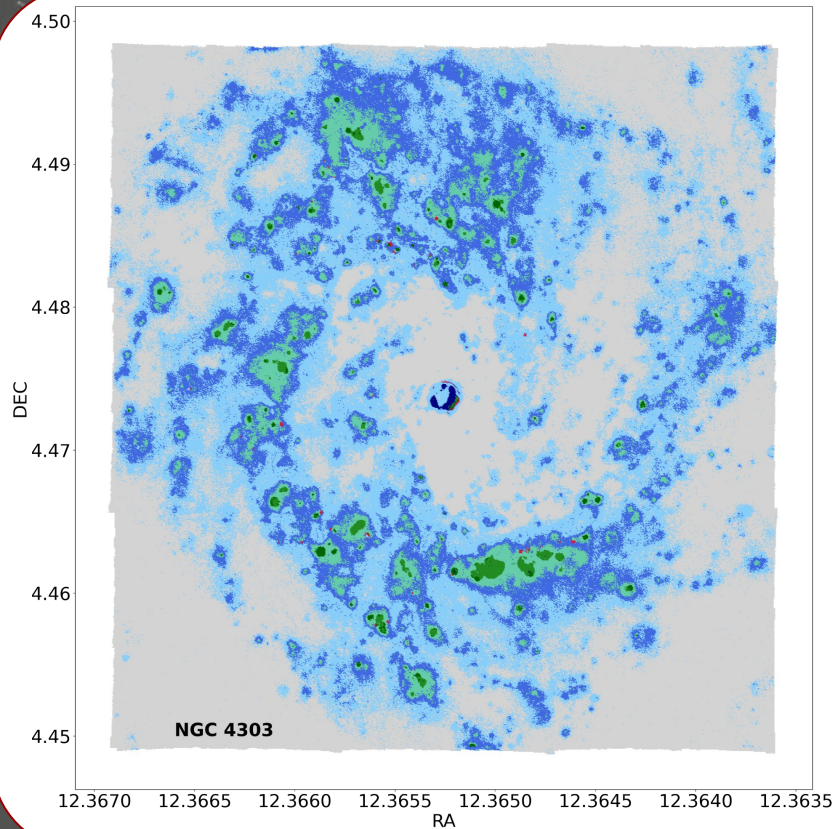
# EXTRAS

# Early preliminary results



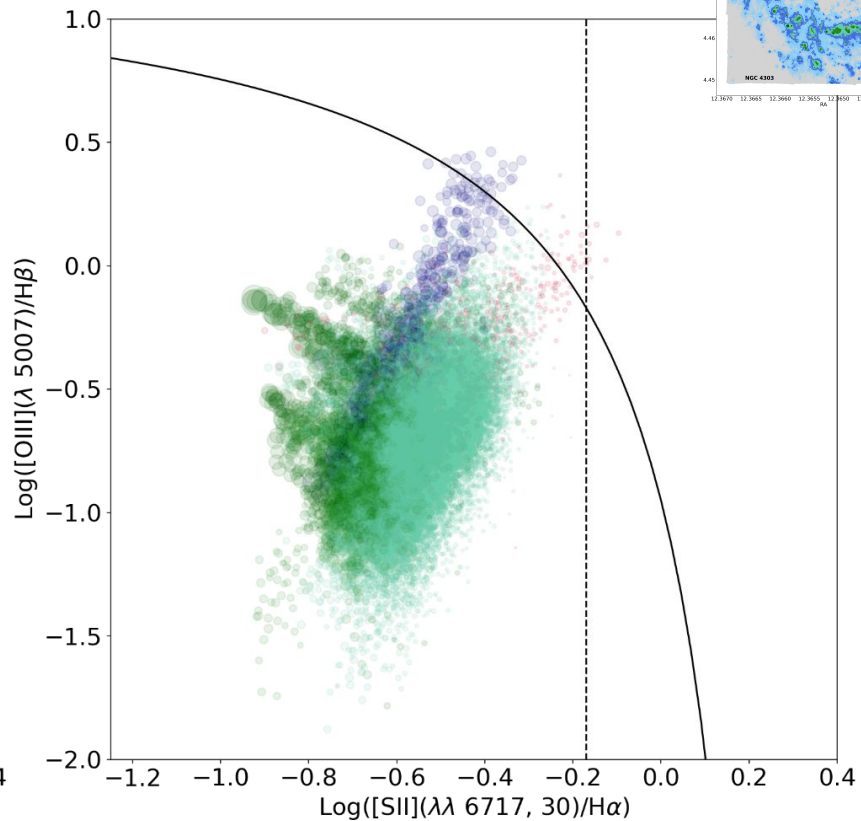
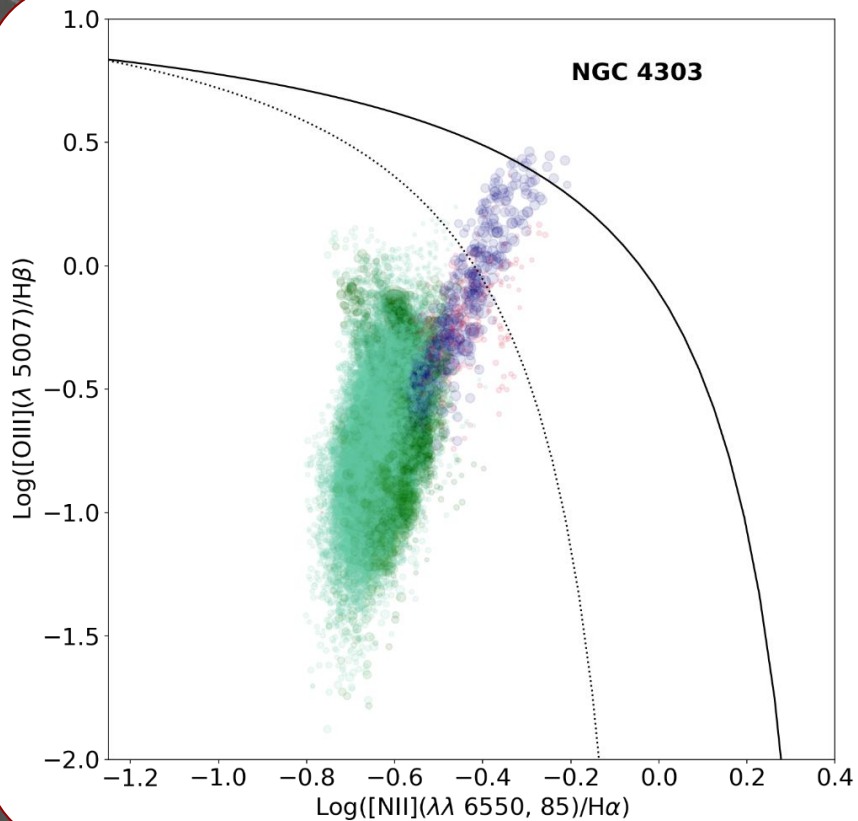
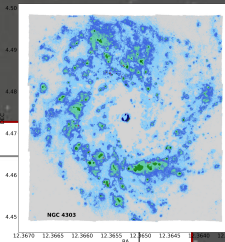
EXTRAS

Early preliminary results



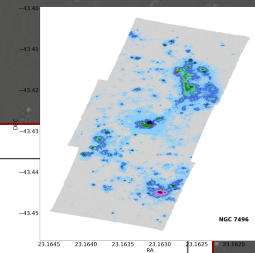
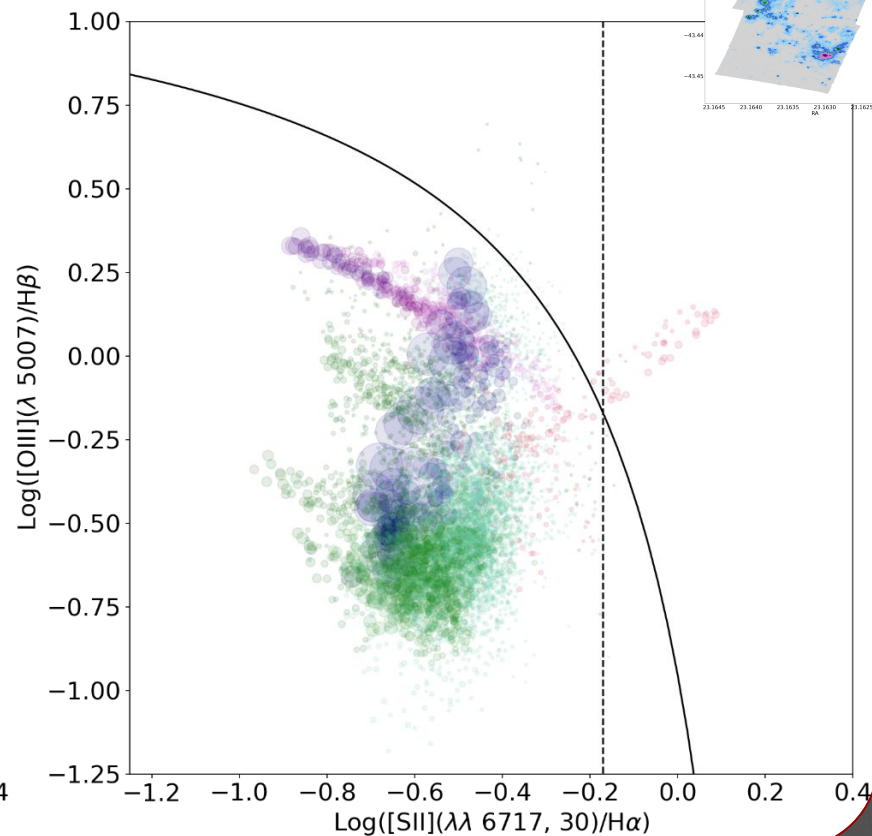
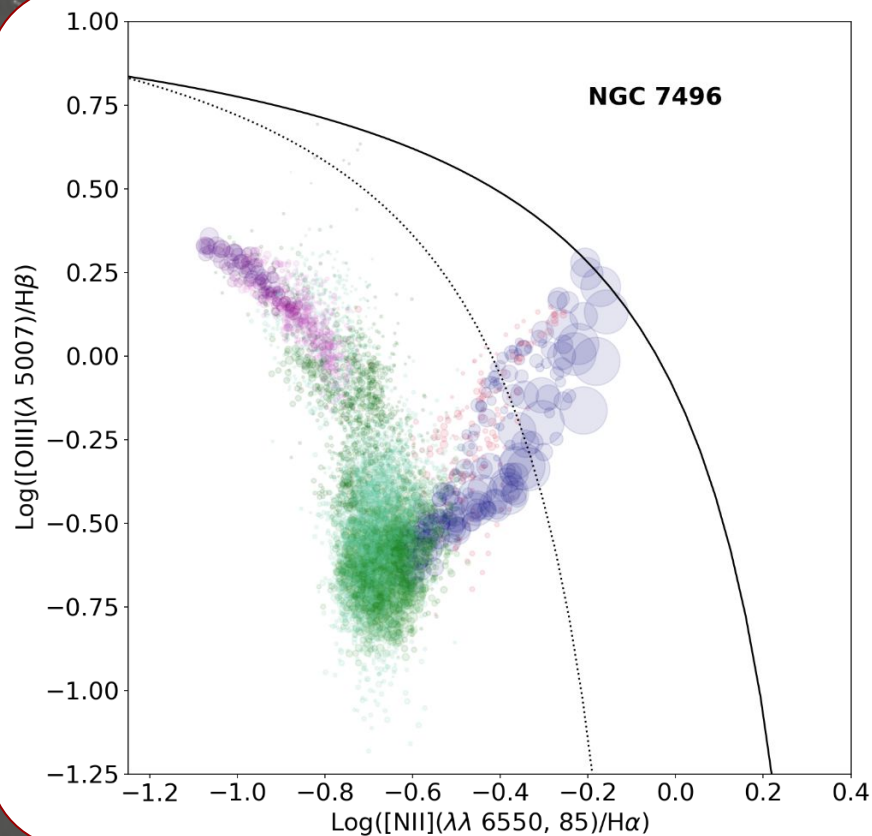
EXTRAS

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