Spatially resolved analysis of stellar feedback and ionised gas properties in ESO 400-43

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PrInt

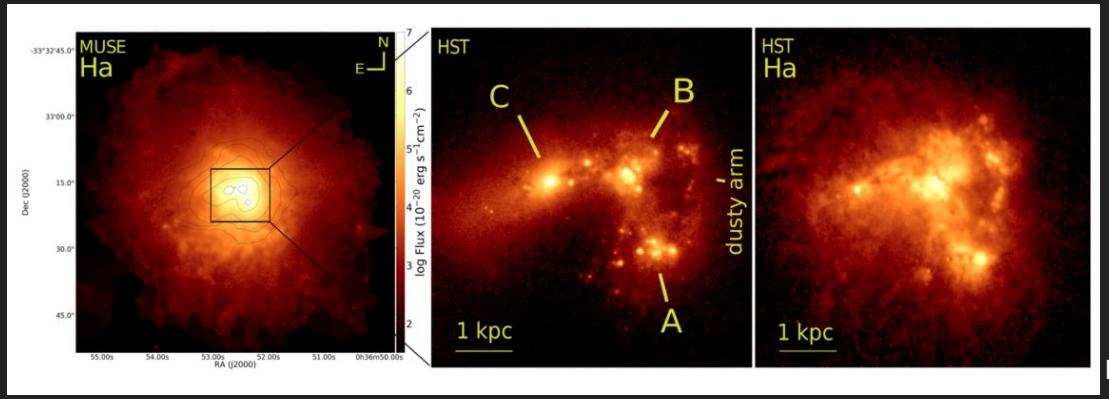
Contents

- Brief introduction
- Ongoing analysis of the BCD ESO 400-43
- Benefits of using BlueMUSE for gas-phase metallicity analysis

Blue Compact Dwarf Galaxies

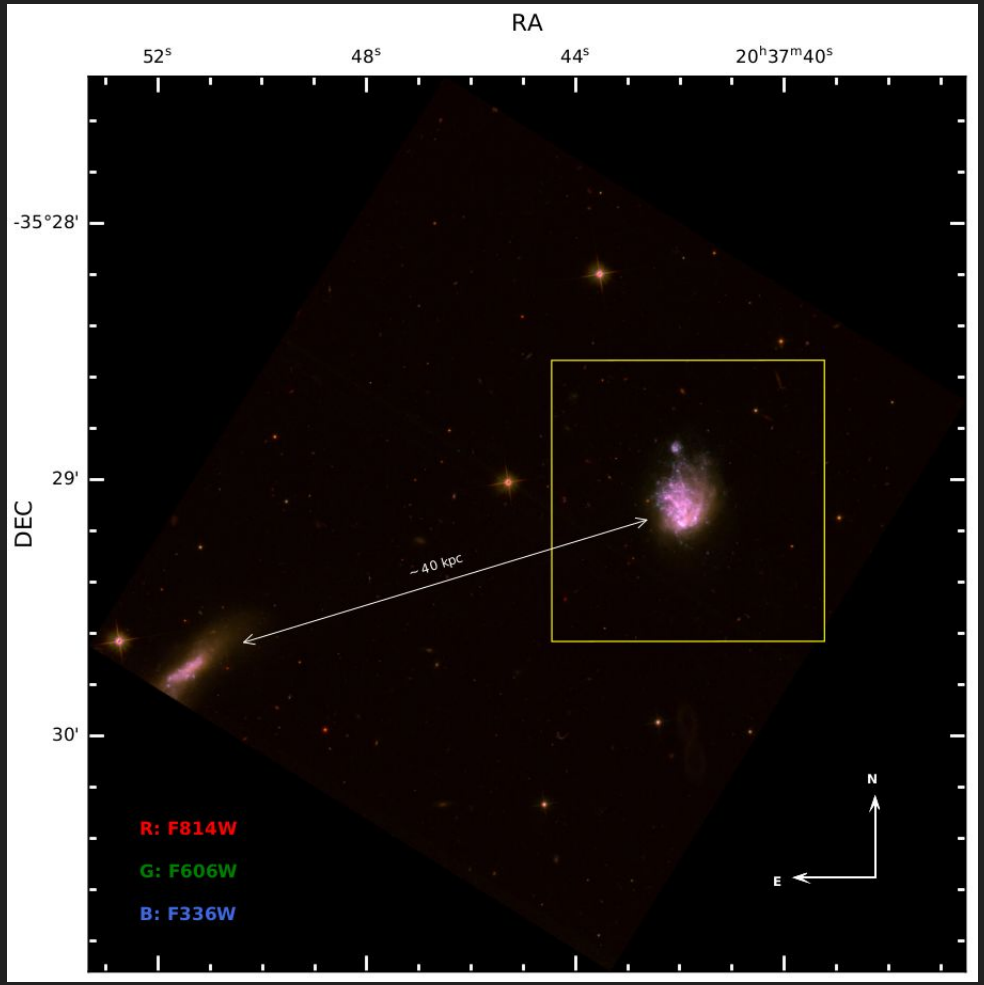
- Compact with elevated rates of Star-Formation
- Low stellar masses ($\lesssim 10^9\ M_\odot$)
- Local analogues of high-*z* galaxies
  - Local LyC leakers – Analogues of the galaxies responsible for re-ionization?
- MUSE allows for spatially resolved studies of
  - Ongoing SF processes (including stellar winds, outflows etc.)
  - Kinematics and dynamics of the ionised gas
  - Stellar populations

Haro 11



Menacho+19

The target



Redshift
$z = 0.0194 \pm 2 \times 10^{-4}$ ($d_L \sim 89$ Mpc)

Stellar mass
$(1.0 \pm 0.3) \times 10^9 M_\odot$ [Bergvall & Jörsäter, 1988]

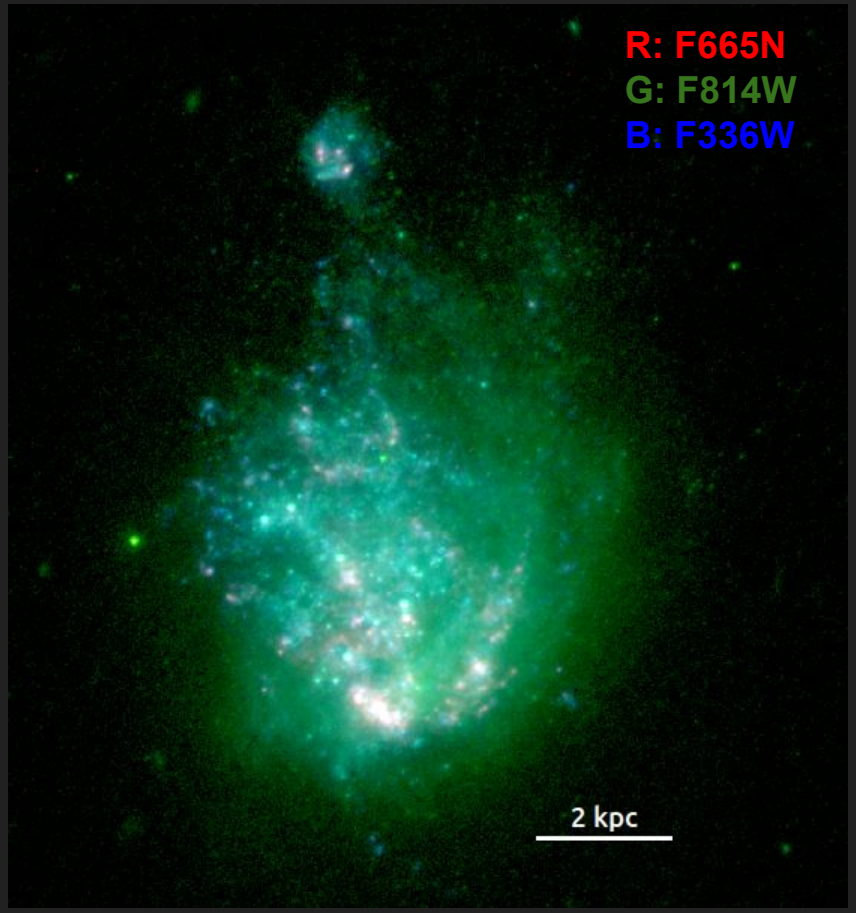
MUSE

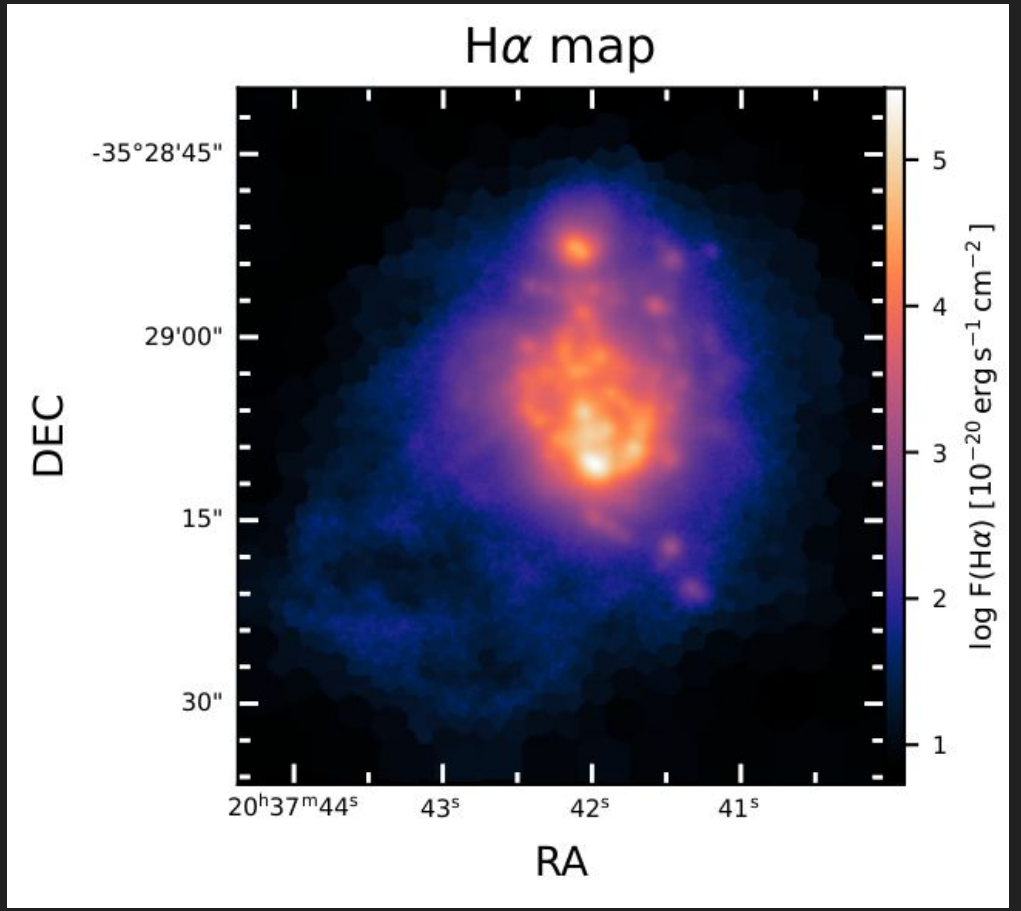
- Adaptive Optics (AO) system
- Wide Field Mode (WFM) → FoV = 1 arcmin²

HST

- 4 broad bands (F336W, F438W, F606W, F814W) + 1 narrow band (F665N)

The target


R: F665N
G: F814W
B: F336W
2 kpc


Hα map
-35°28'45"
29'00"
15"
30"
DEC
20h37m44s
43s
42s
41s
RA
log F(Hα) [10−20 erg s−1 cm−2]
5
4
3
2
1

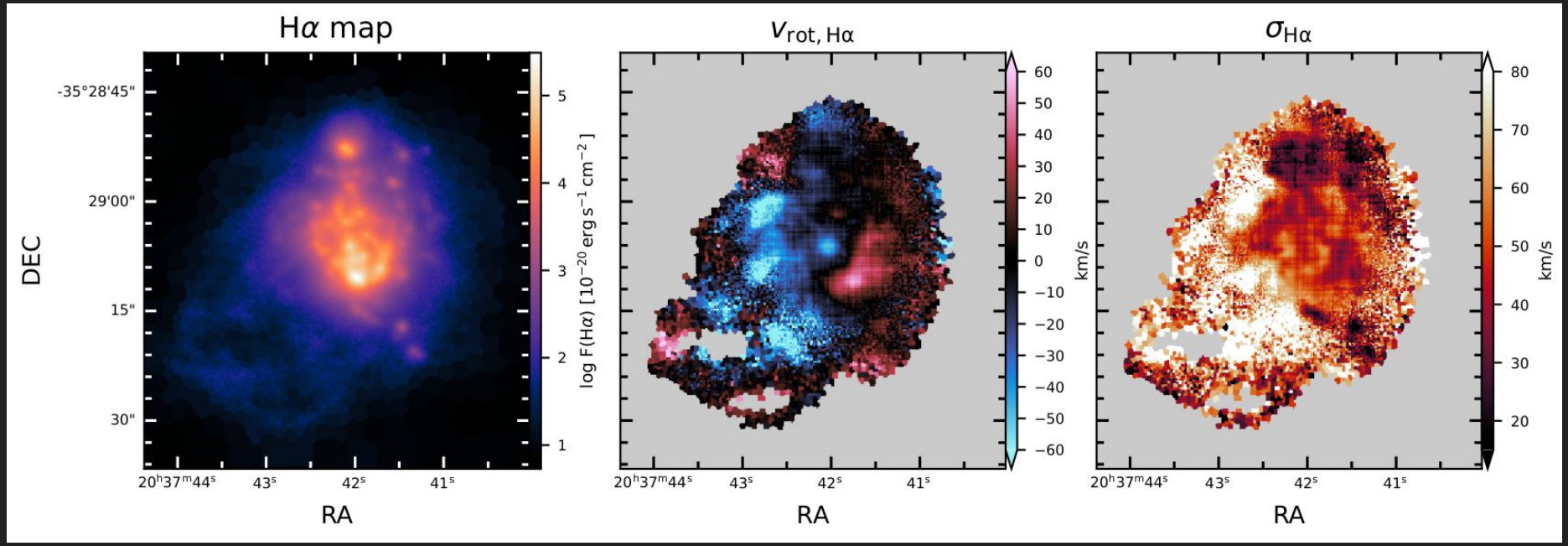
Kinematics of the ionised gas

SPS with pPXF to model the continuum

- Voronoi binning on the continuum (5020 – 5060 Å) to $(SNR)_T$ = 150. Production of “pure gas” cube

Kinematics

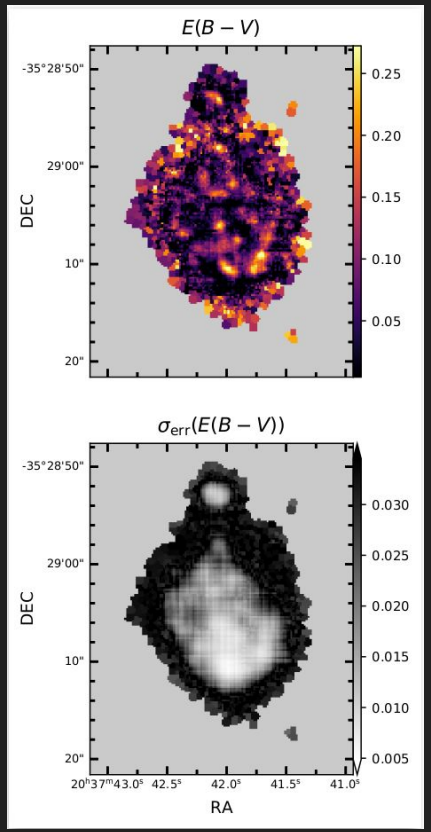
- Single gaussian fit to Hα line profile. Voronoi binning to $(SNR)_T$ = 10 on Hα emission.

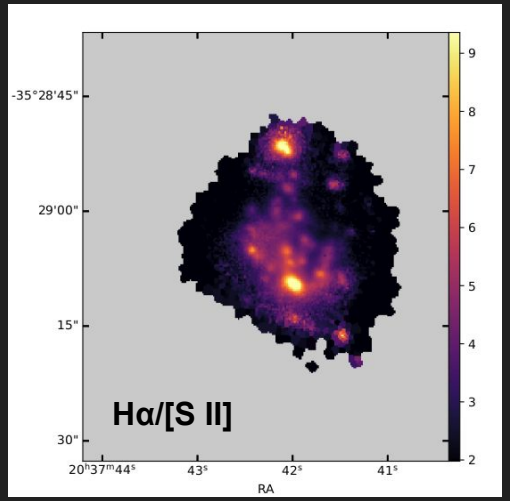


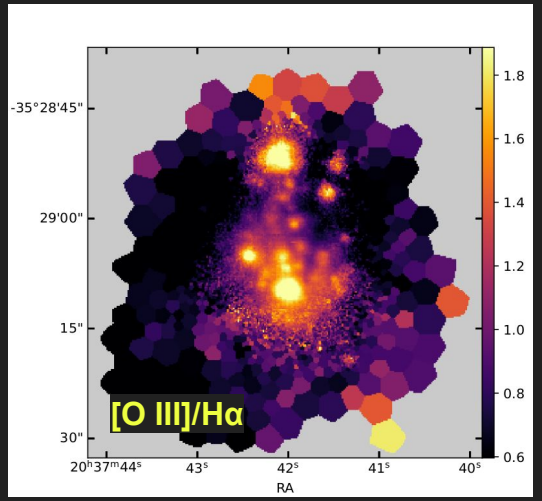
Emission-line maps

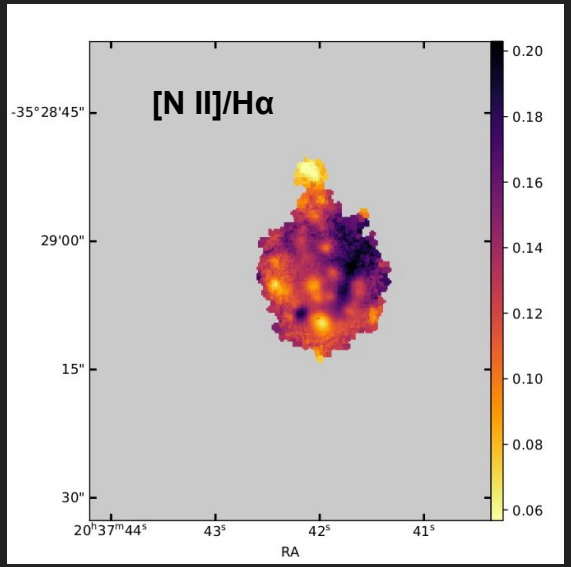
Correction for extinction

- Balmer decrement assuming case B of recombination



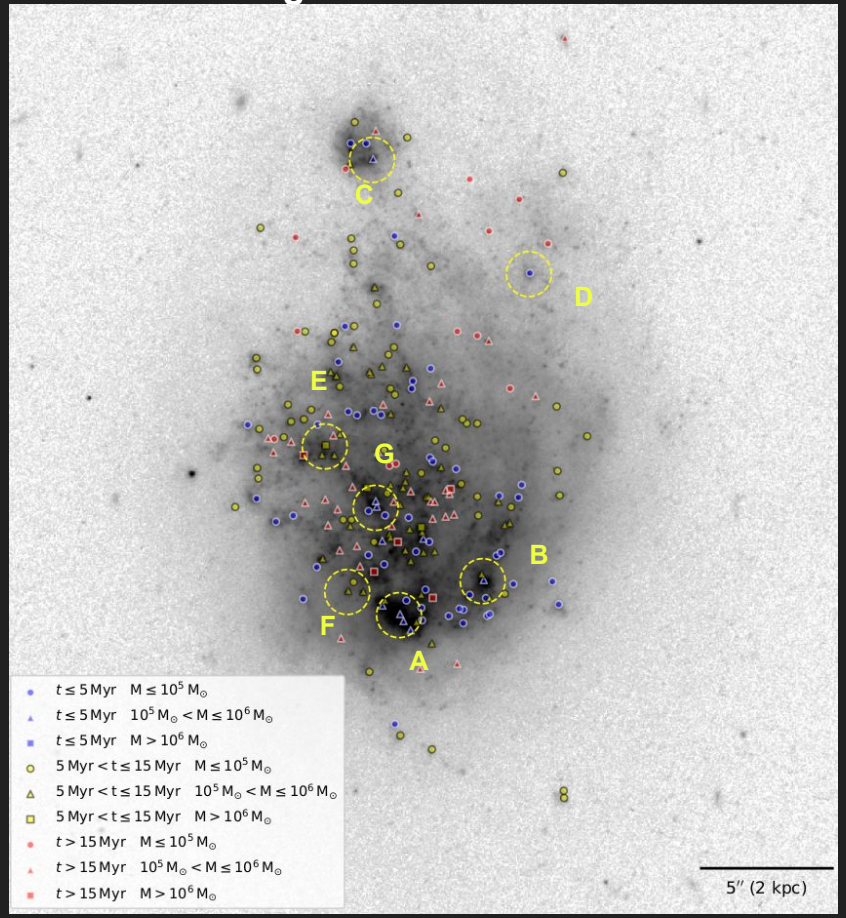


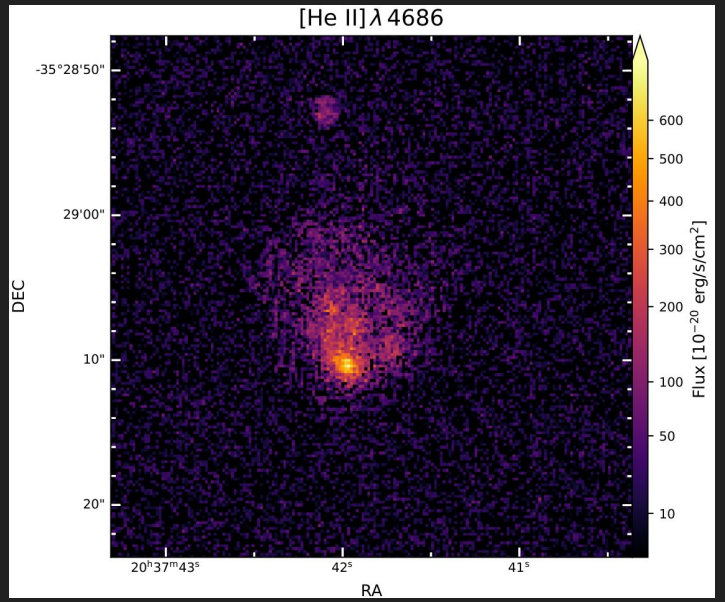


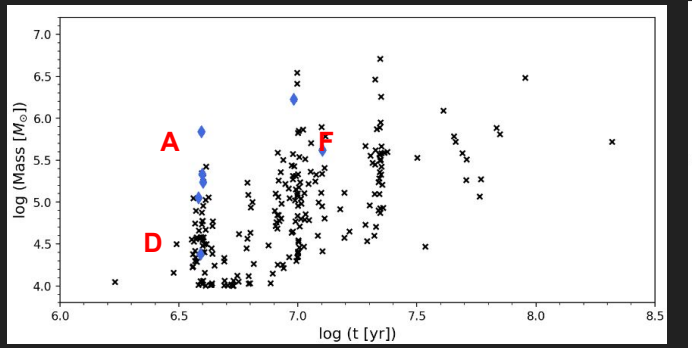


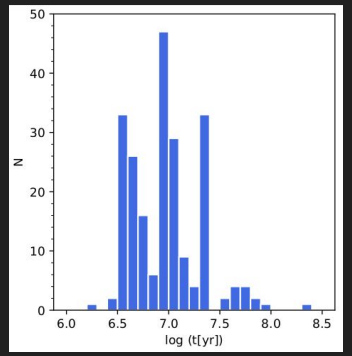
SED fitting

- SED fitting with PROSPECTOR

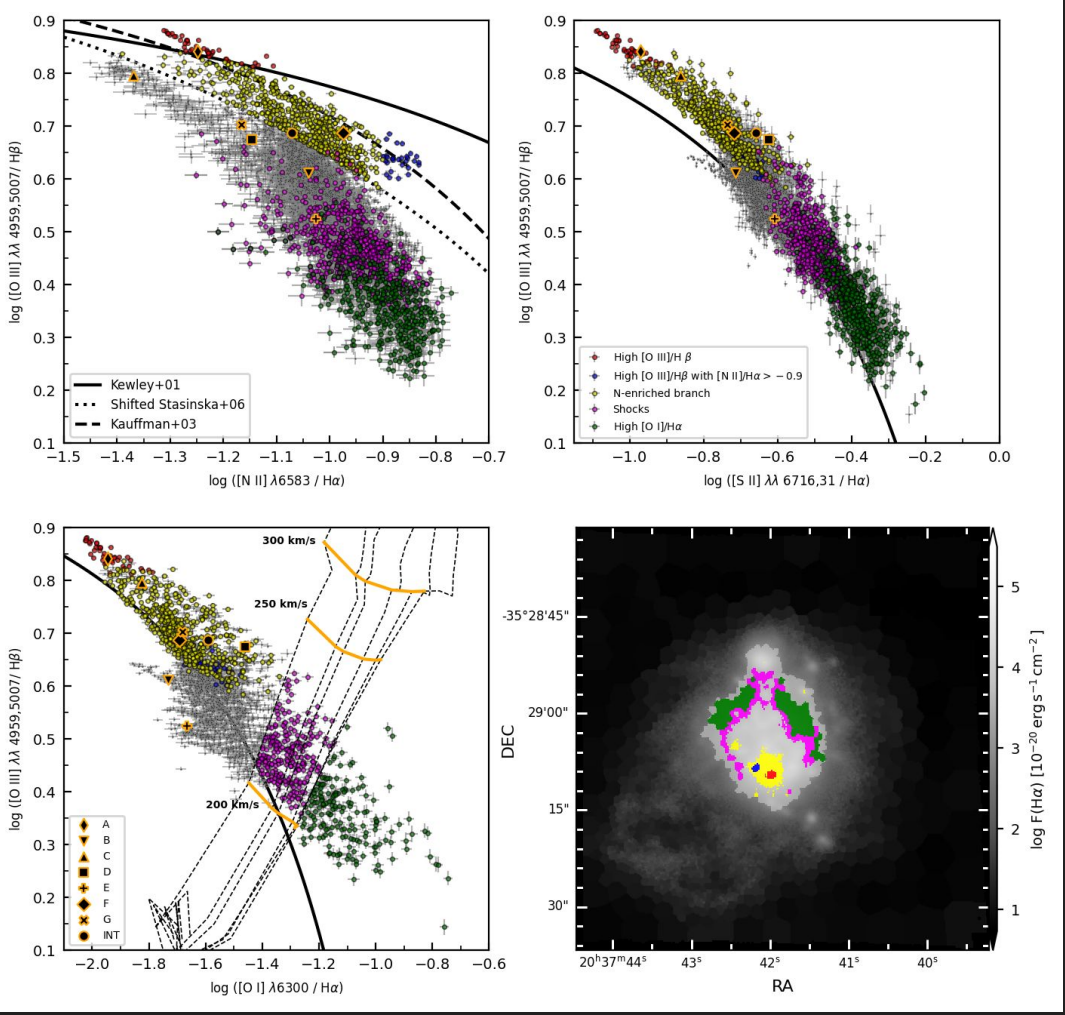


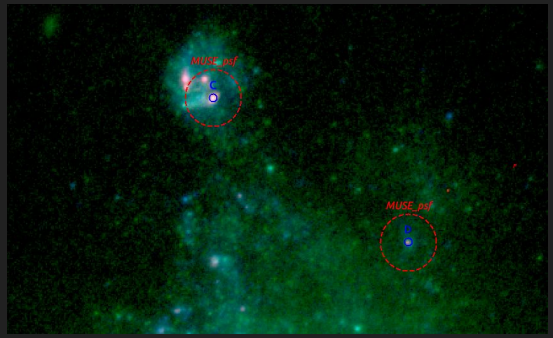


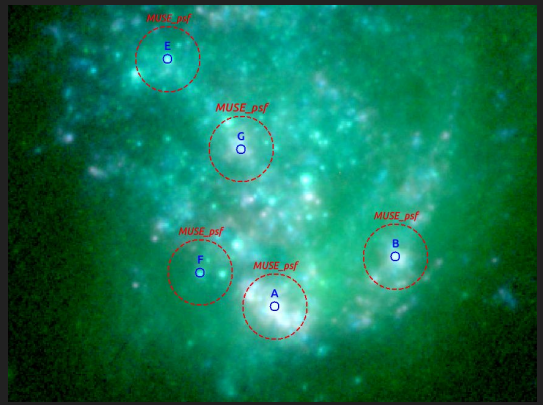




Spatially resolved BPT diagnostic diagrams

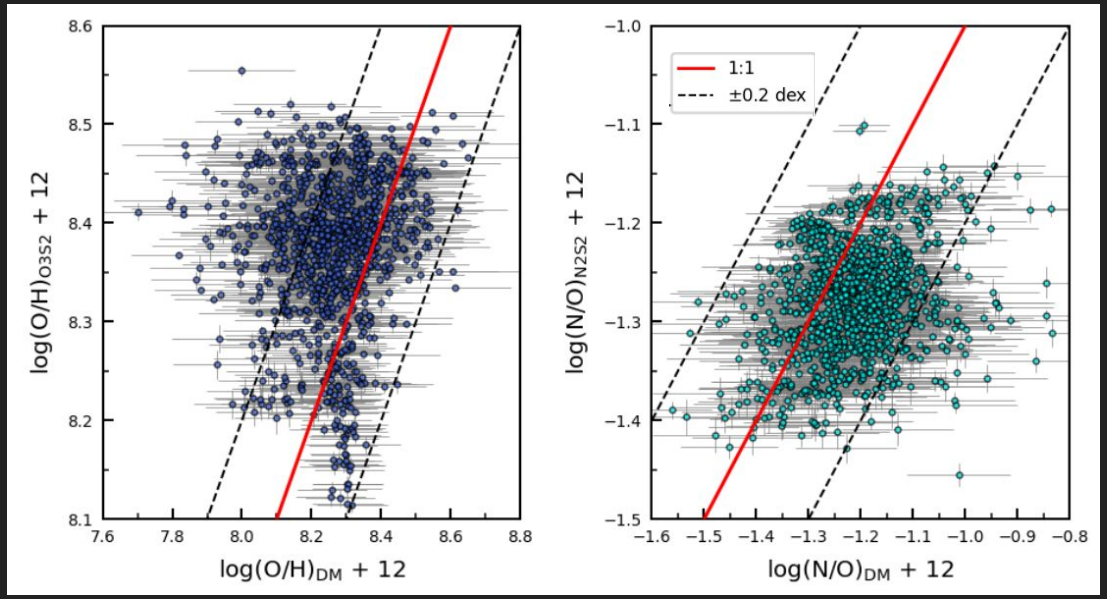


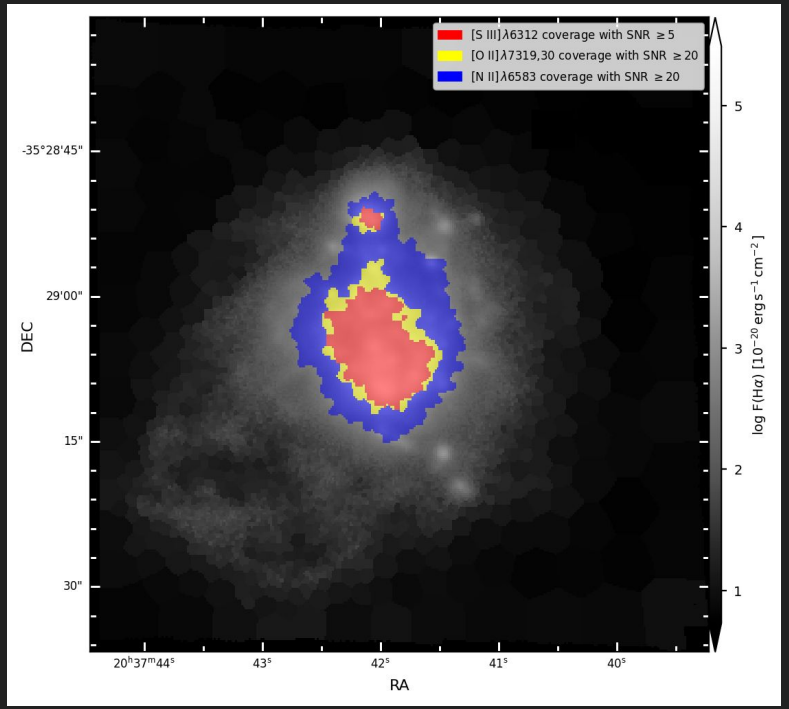


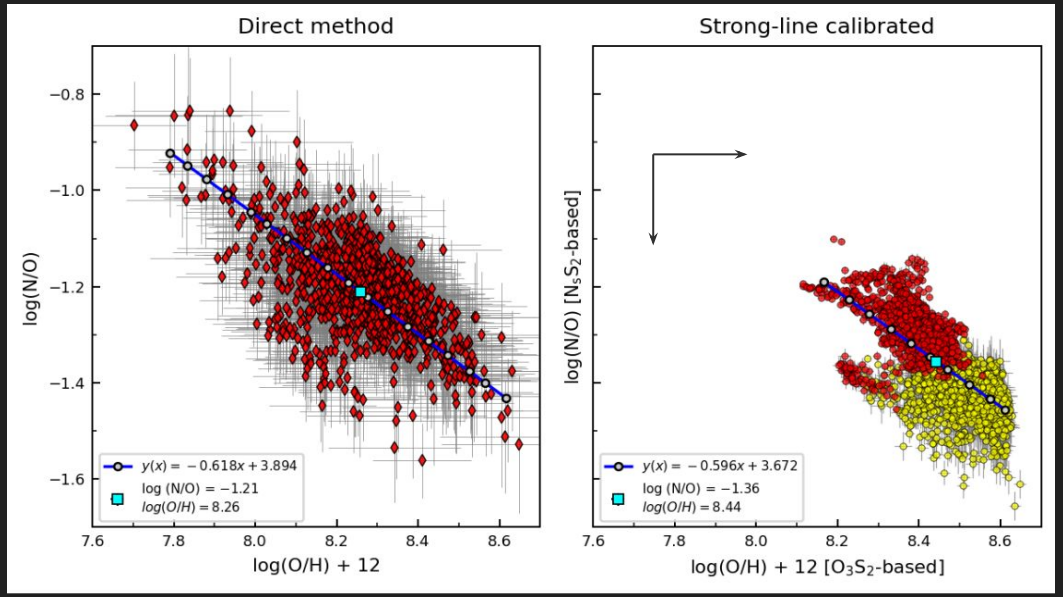


Gas-phase metallicity

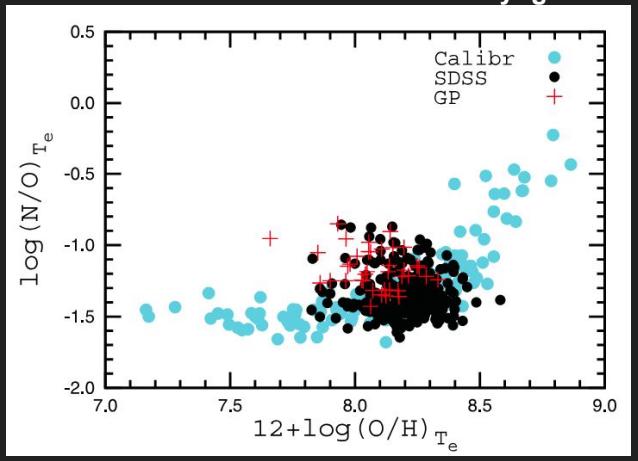
- T_e estimate via [S III] λ6312,9069 ⇒ $T_e = 1.077^{+0.109}_{-0.116}\ [10^4\ K]$
- n_e estimate via [S II] λ6716,31 ⇒ $n_e = 126.6^{+105.1}_{-89.5}\ [\mathrm{cm}^{-3}]$

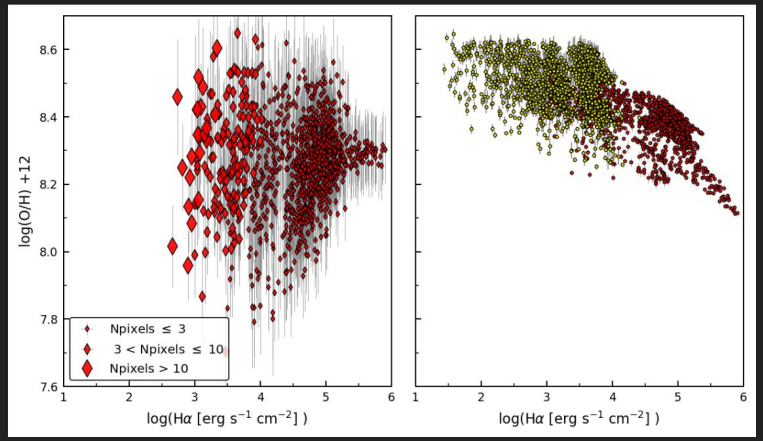






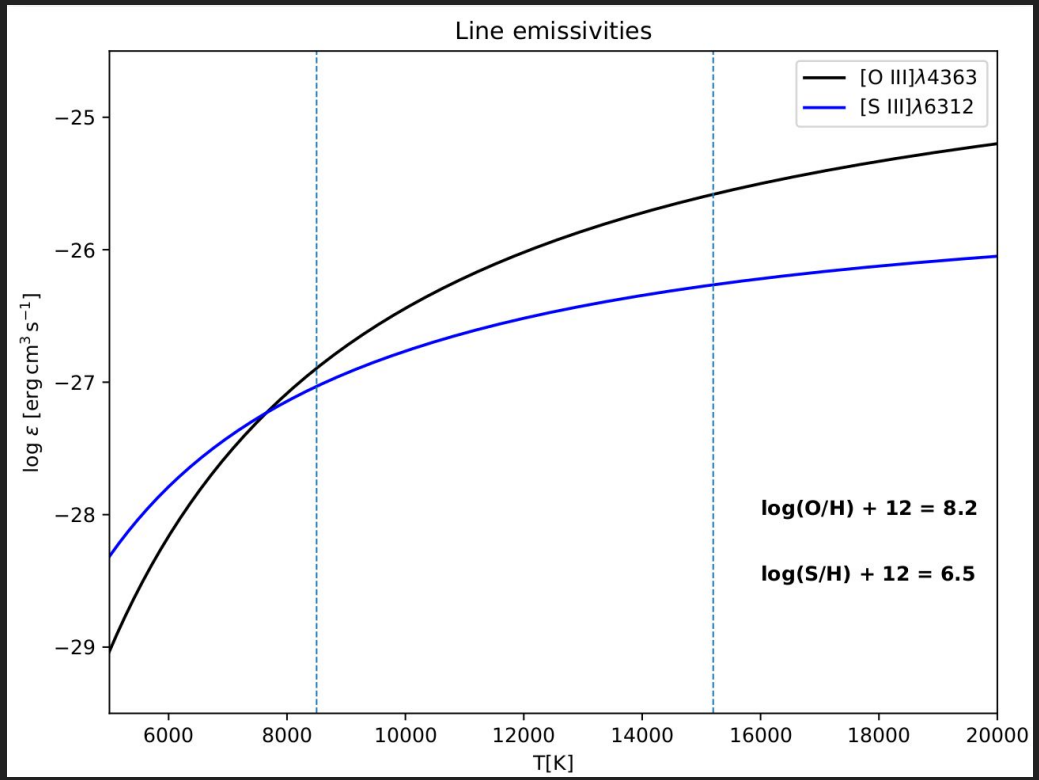
Pilyugin+12





Secondary effect of U on metallicity indicator?

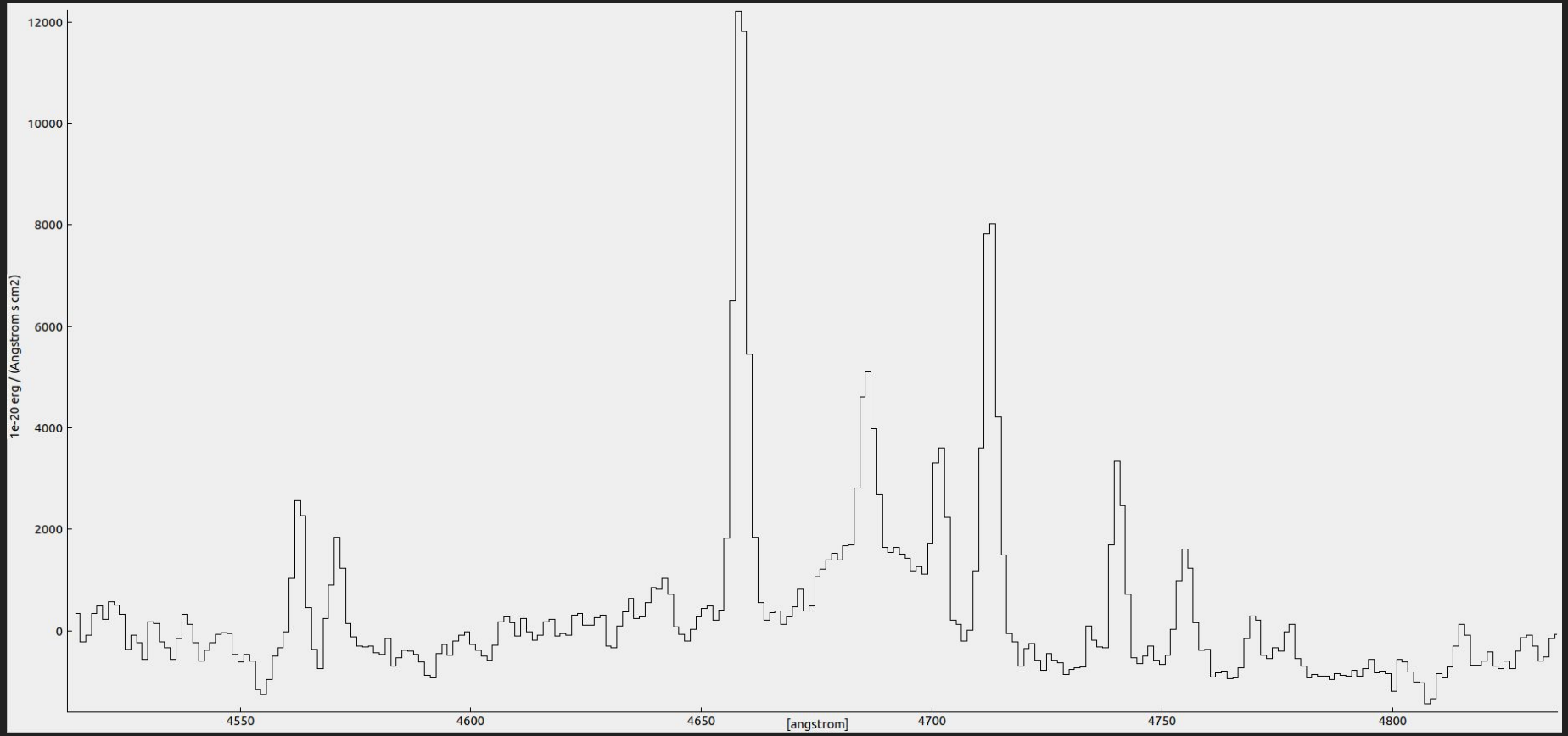
Using BlueMUSE to deepen our understanding on the low-metallicity ISM of ESO 400-43

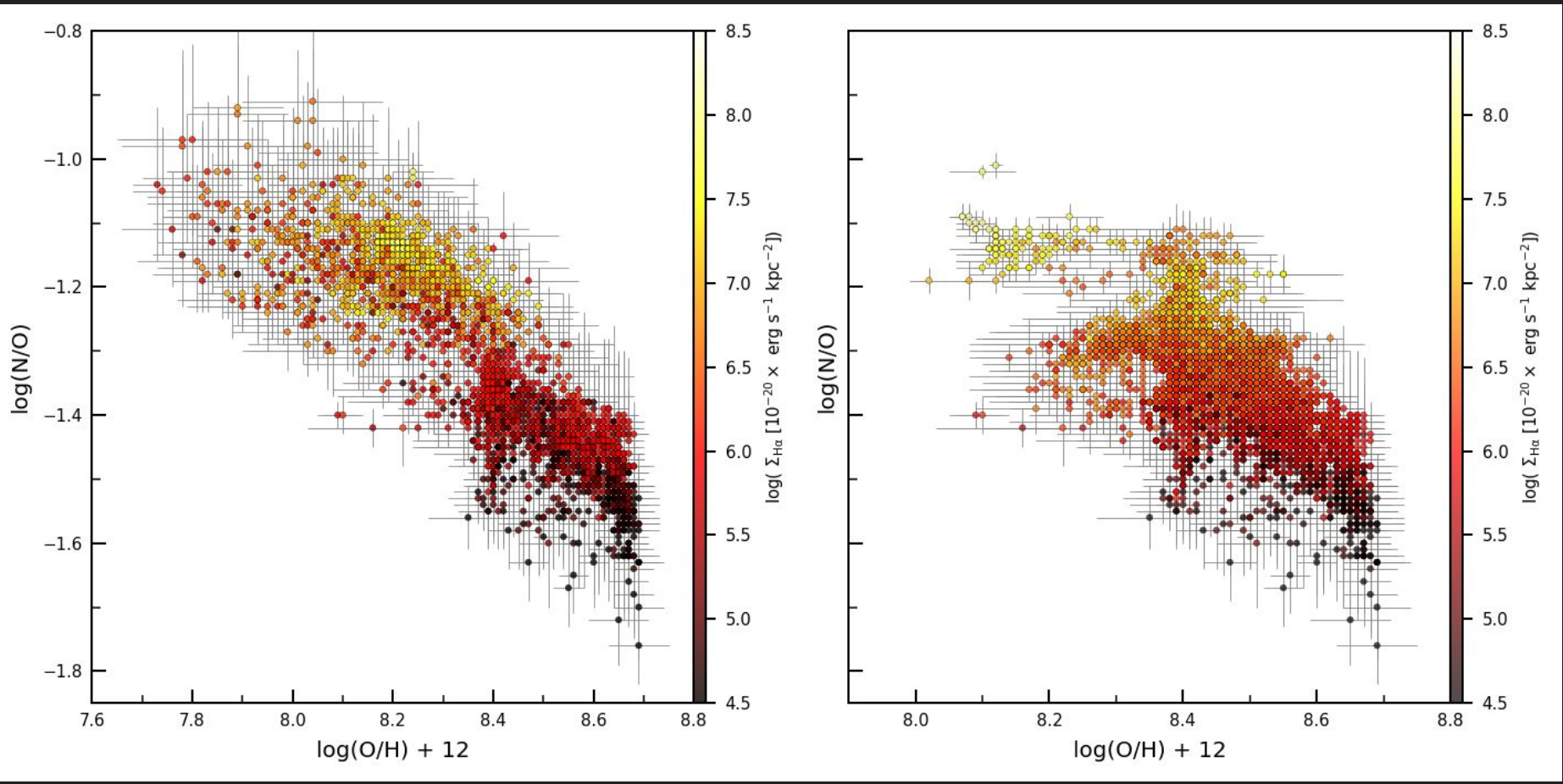


- Detection of [O III] λ4363 is feasible and allows to study ESO 400-43 ISM further out
  - How real is the discrepancy of the gas-phase metallicity in the outskirts?
  - Is the anti-correlation with Hα driven by the U dependence of the calibrator?
- Detection of [O II] λλ3726,29
  - Alternative determination of O^+/H^+ (now relying on [O II] λλ7319,30)
  - Full description of the 3 temperature zones (h: [O III] λ4363, m: [S III] λ6312, l:[O II] λλ3726,29)
  - Test T_e – T_e relations in the regime of metal-poor ISM of our BCD

Thank you very much!

Questions?


12000
10000
8000
6000
4000
2000
0
1e-20 erg / (Angstrom s cm2)
4550
4600
4650
[angstrom]
4700
4750
4800


log(N/O)
log(O/H) + 12
log(Σ_Hα [10^−20 × erg s^−1 kpc^−2])
−0.8
−1.0
−1.2
−1.4
−1.6
−1.8
7.6
7.8
8.0
8.2
8.4
8.6
8.8
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5