

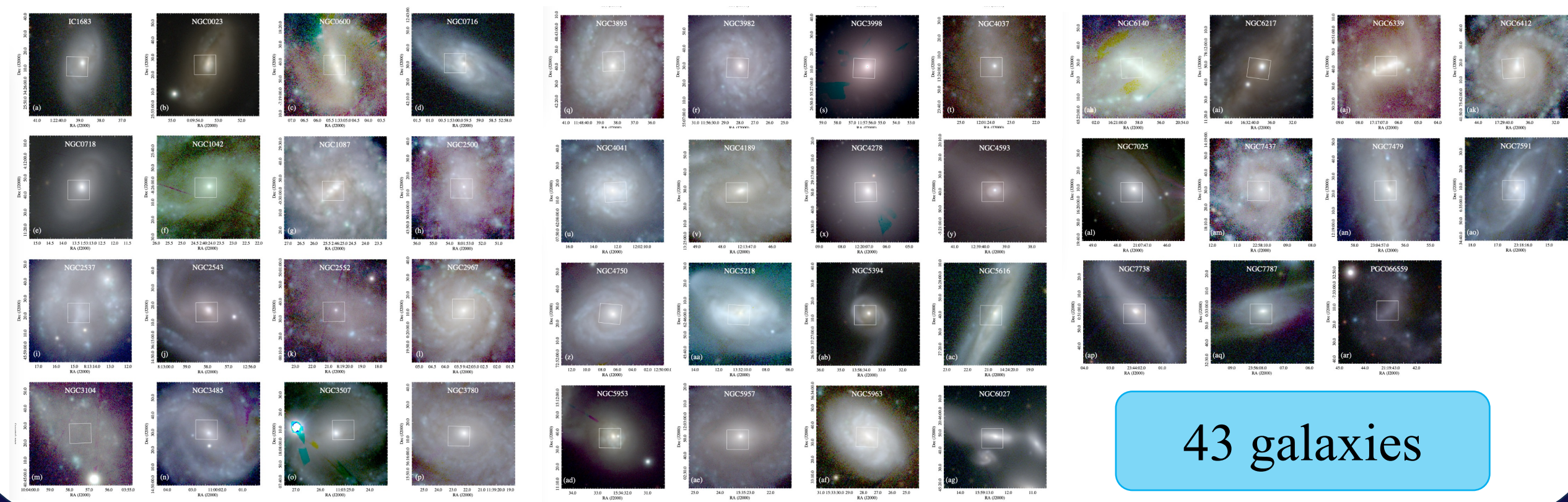
MEGADES: MEGARA galaxy disc evolution survey

Ionised gas diagnosis

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MEGADES



43 galaxies

All data available in:

www.megades.es



MEGADES

username: public
password: 6BRukU55E

MEGADES-S4G selection criteria:

- Distance < 40 Mpc ($z \sim 0.0092$)
- Galactic latitude $|b| > 30^\circ$
- Apparent magnitude $m_{B,corr} < 15.5$ mag
- Declination Dec (J2000) $> -20^\circ$
- Apparent diameter $2.5' < D_{25} < 4'$
- Inclination $i < 70^\circ$

Random subsample of 30 (out of 215) S4G (Sheth et al., 2010, PASP) galaxies fulfilling the criteria

13 CALIFA (Sánchez et al., 2012, A&A) galaxies with $EW_{ISM-Nad} > 1.5 \text{ \AA}$ (OT)

Data

Telescope Time

114 hours (88 GT + 26 OT)

LR-B

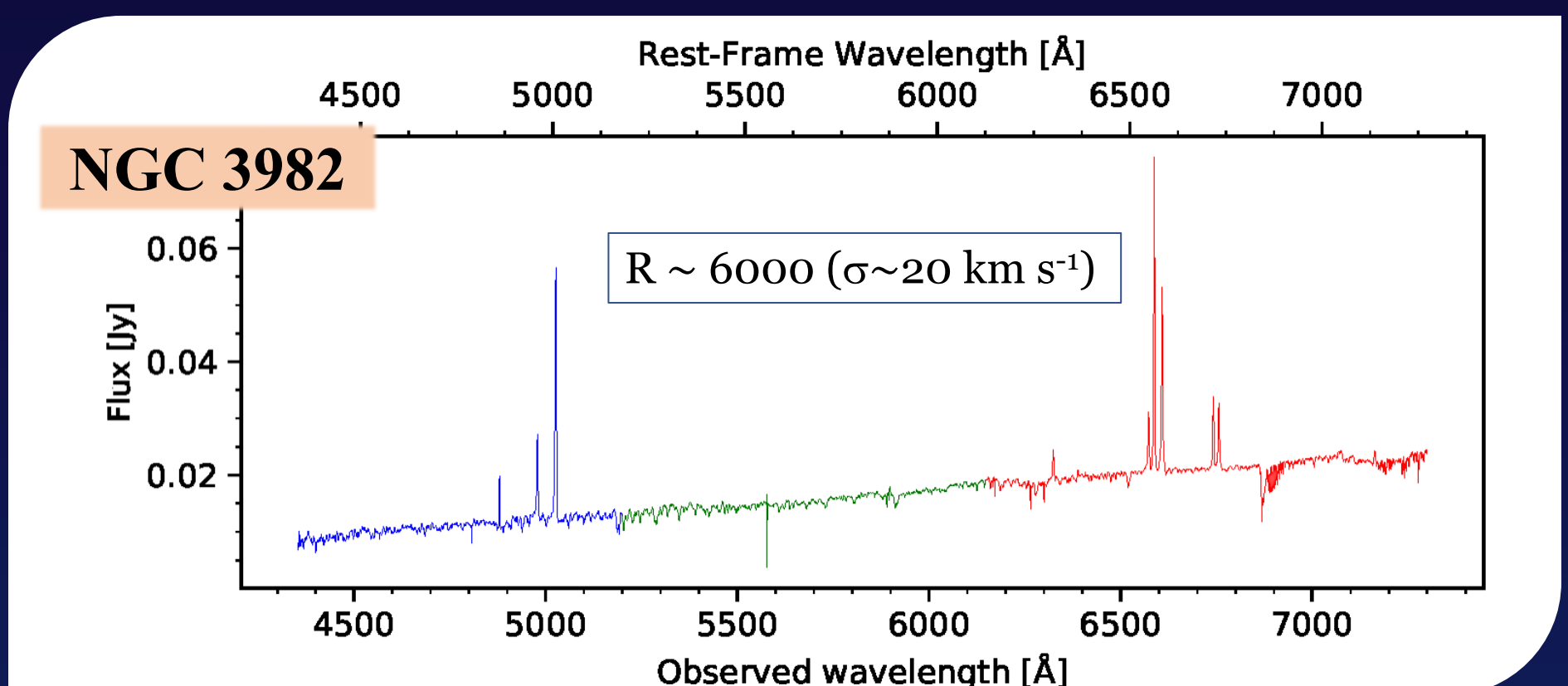
VPH480-LR (4350.61 – 5250.83 Å)

LR-V

VPH570-LR (5165.57 – 6176.18 Å)

LR-R

VPH675-LR (6158.34 – 7287.67 Å)



65772 single spectra in MEGADES

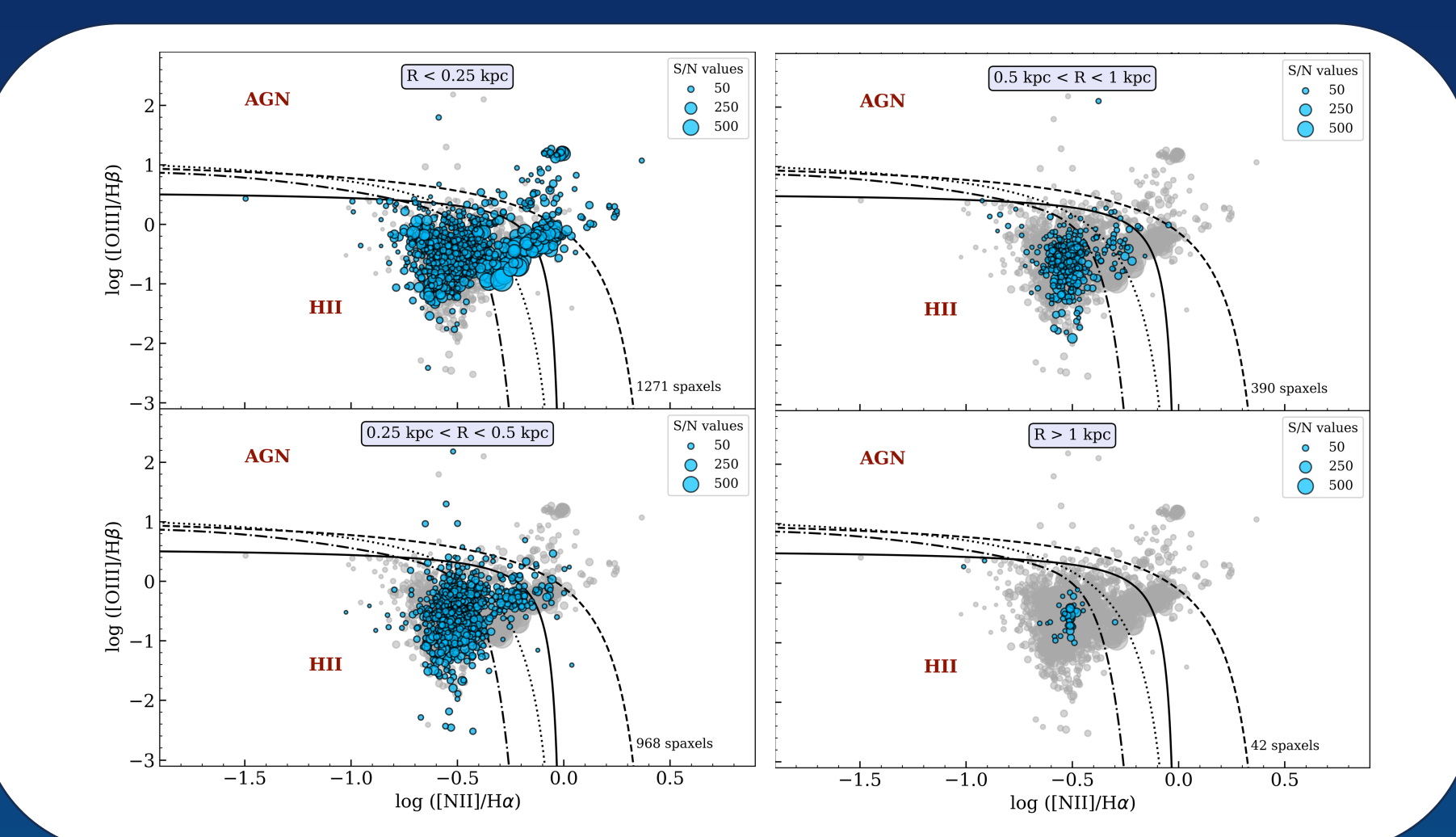
More info in Chamorro-Cazorla et al. 2023



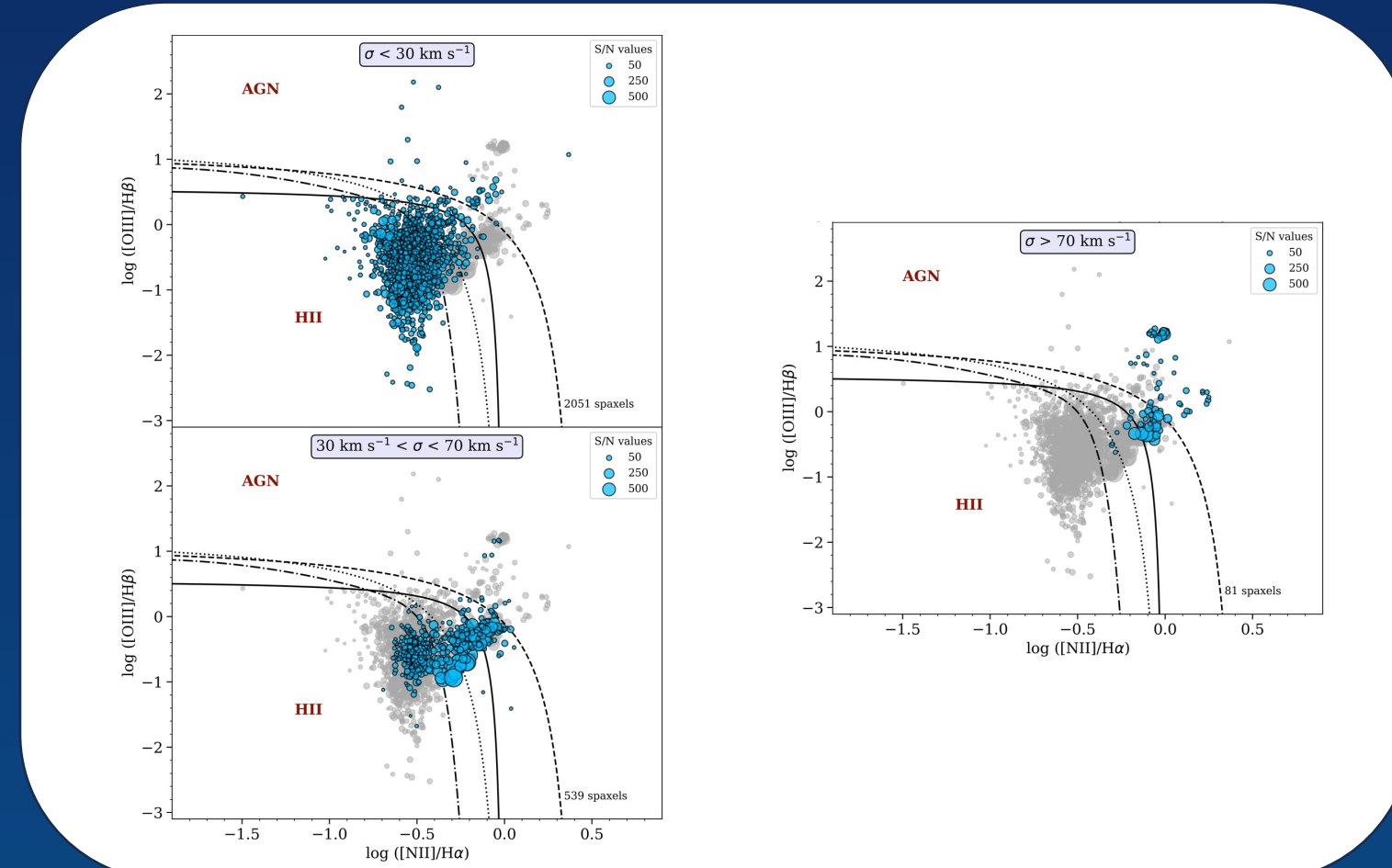
MEGADES PAPER

Diagnostic Diagrams

BPT diagrams created for different galactocentric distances



BPT diagrams created for different velocity dispersions for Hα

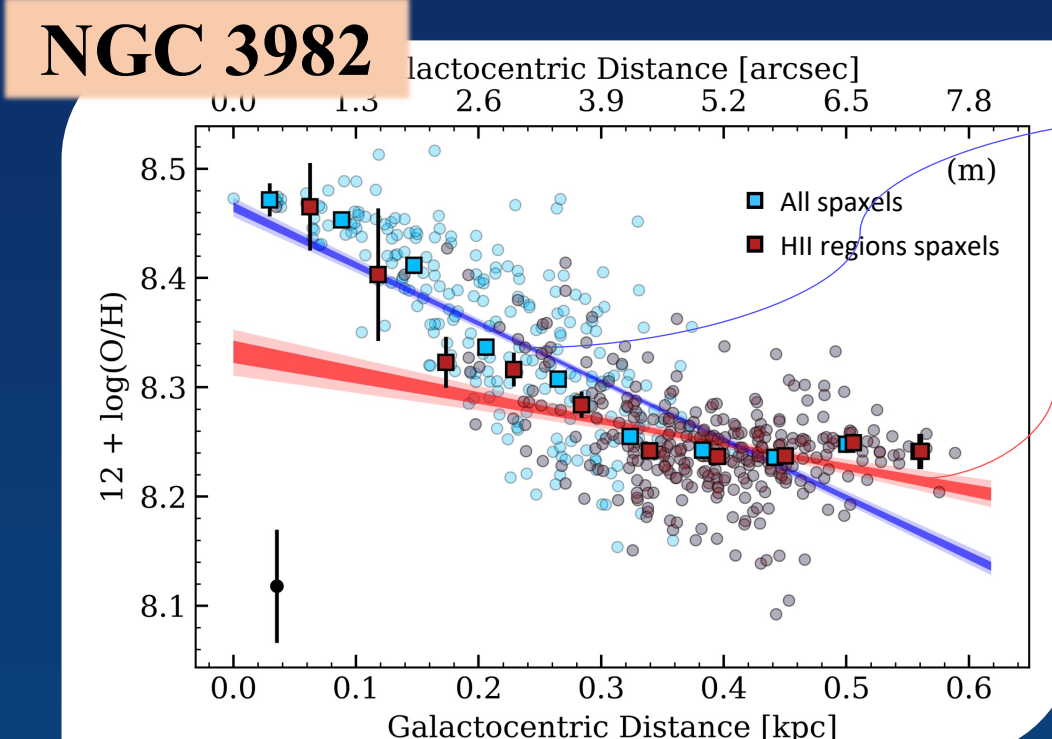


- Spaxels located in the AGN excitation region disappear after the first distance cut
- Photoionisation becomes the only excitation mechanism existing as we get further away from the centre

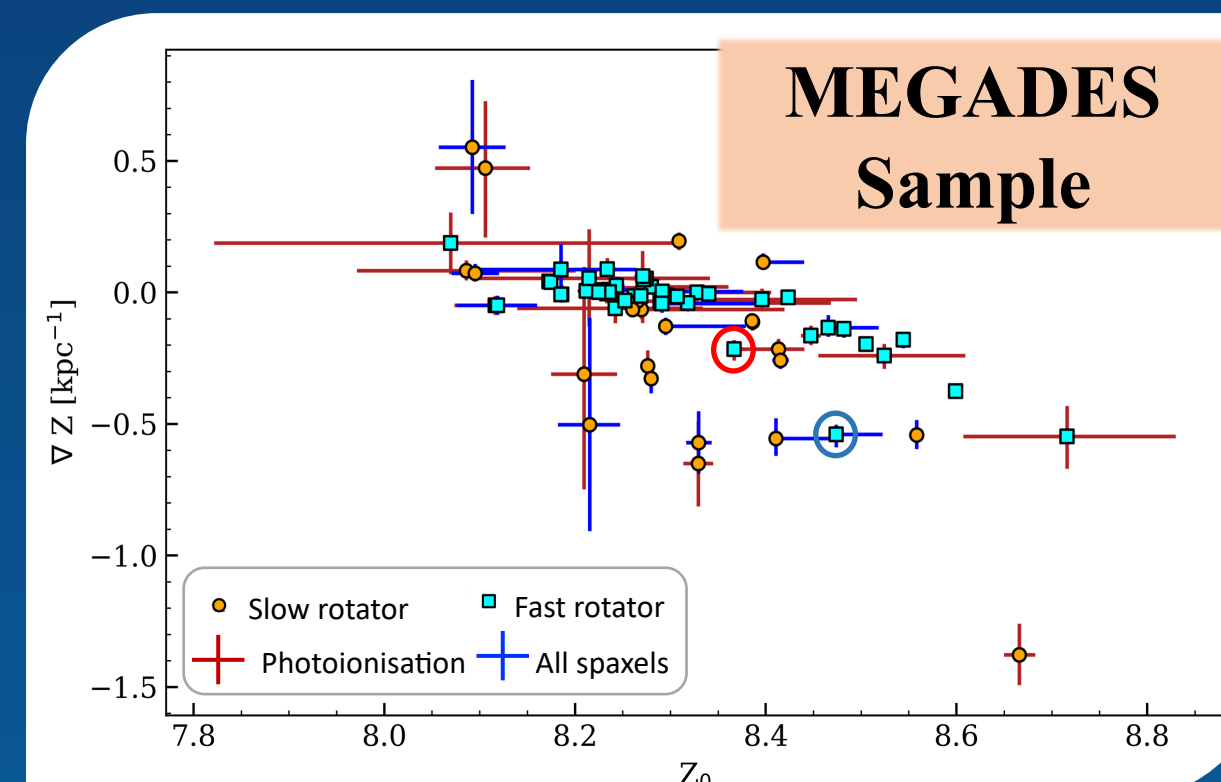
- For $\sigma < 30 \text{ km s}^{-1}$ most of spaxels are located in the photoionisation region
- For $30 \text{ km s}^{-1} < \sigma < 70 \text{ km s}^{-1}$ we still obtain a majority of photoionisation-dominated line ratios but they occupy regions closer to the AGN region
- For $\sigma > 70 \text{ km s}^{-1}$ most of spaxels fall in the AGN-dominated line ratios region, specially in the [OIII]/Hβ vs [NII]/Hα diagram

Metallicity Gradients

Estimation of $12 + \log(O/H)$ based on N2 indicator (Marino et al. 2013)



- Gradient estimated using all spaxels
- Gradient estimated using spaxels from HII regions
- Gradients calculated by dividing the galactocentric distances into 10 equal intervals and computing the median value for each.



Slopes and intercepts for all galaxy fits using all spaxels and HII region spaxels, with each galaxy appearing twice

- Includes information from kinematic analysis
- Gradients measured in regions less than 1 or 2 kpc

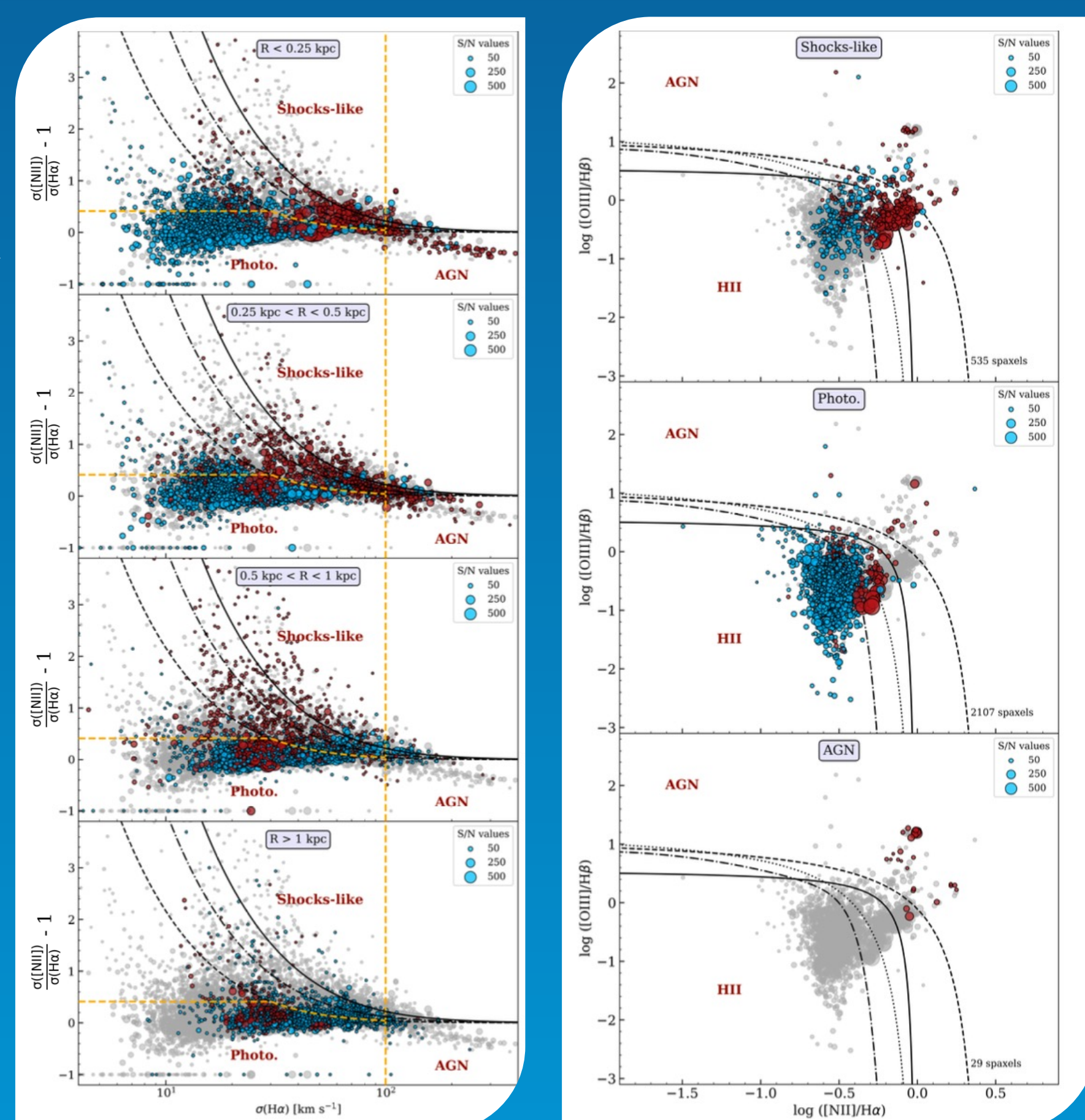
Dynamical selection of excitation mechanisms

[NII] lines are very sensitive to low-velocity shocks

Hα lines (Balmer) are sensitive to all mechanisms

Dynamical selection criteria:

- $\sigma(H\alpha) > 100 \text{ km s}^{-1}$ is considered to be the AGN limiting border (Vaona et al., 2012, MNRAS established $\sigma = 85 \text{ km s}^{-1}$ as the lower limit for NLR)
- $\sigma(H\alpha) < 30 \text{ km s}^{-1}$ we make a cut at constant $\sigma([NII]) / \sigma(H\alpha) - 1 = 0.414$
- $30 \text{ km s}^{-1} < \sigma(H\alpha) < 100 \text{ km s}^{-1}$ we apply a constant (quadratic) broadening in velocity of 30 km s^{-1}



Key take-aways

High spatial and spectral resolution BPT diagrams with MEGARA

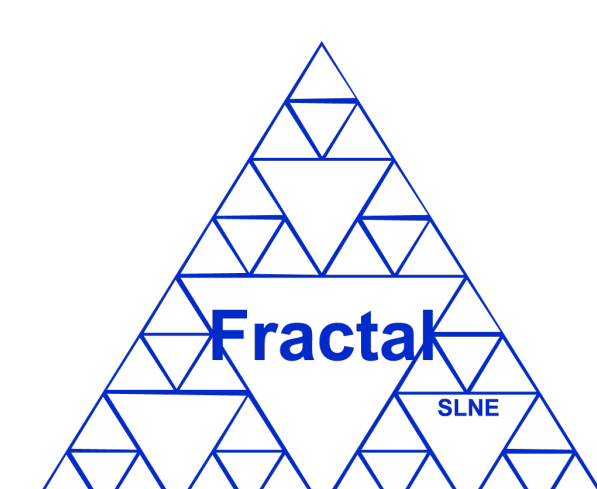
We find that when applying different cuts in galactocentric distance and in velocity dispersion of Hα the populated areas of BPT diagrams are significantly segregated

We introduce a new diagnostic criterion based on the dynamic state of ISM which employs only the Hα-[NII] line group

We measure metallicity gradients at high spatial resolution in the inner regions of the galaxies in MEGADES sample

Stay tuned for our next MEGADES papers on the analysis of stellar populations and kinematics!

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