The physical conditions in $0.6 < z < 1.0$ galaxies from LEGA-C

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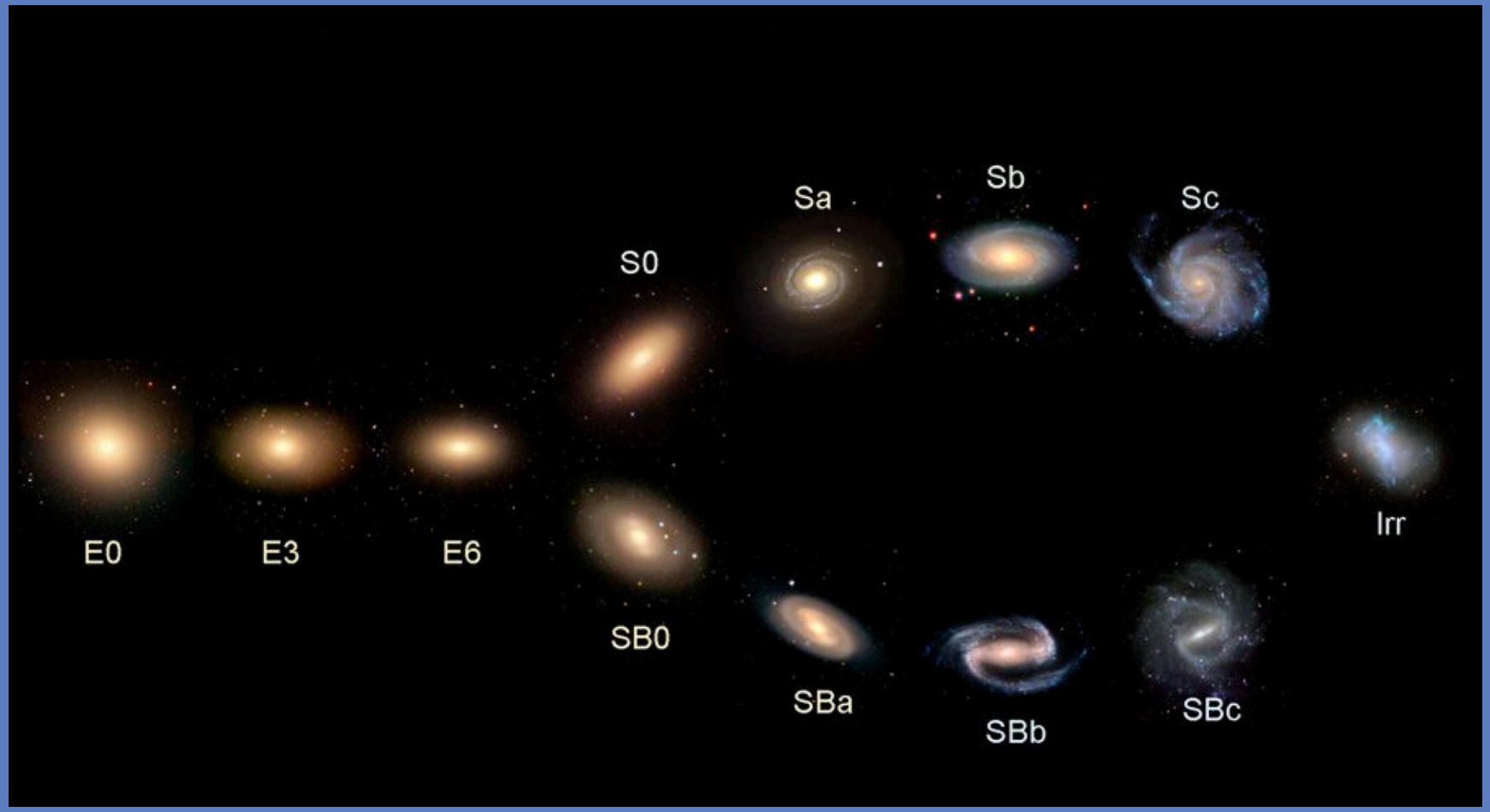
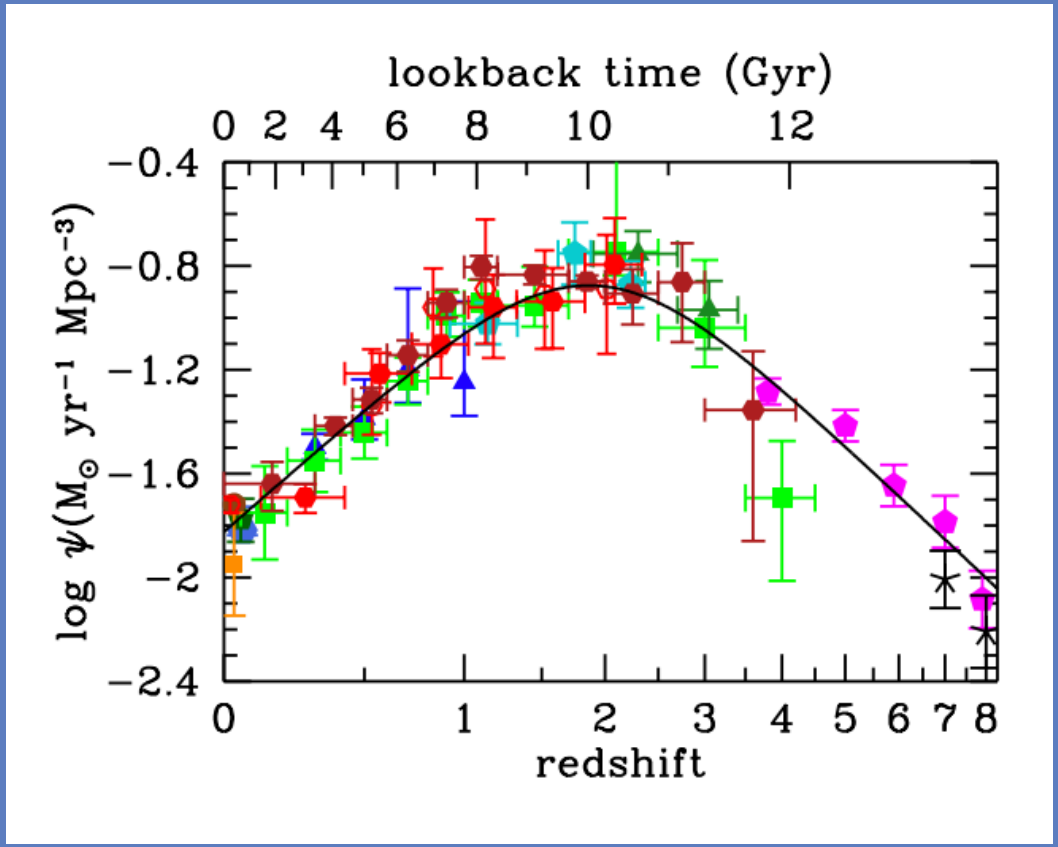
CARNEGIE SCIENCE

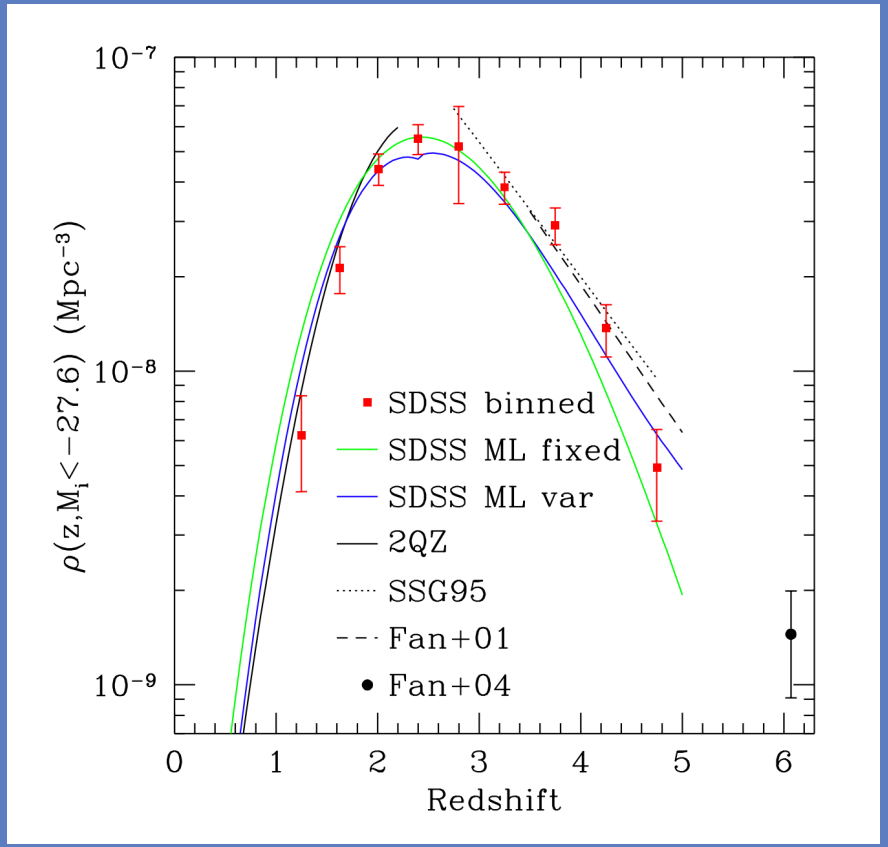
Why do we care about 0.6 < z < 1.0 galaxies?



Why do we care about 0.6 < z < 1.0 galaxies?



Plot from Madau+2014



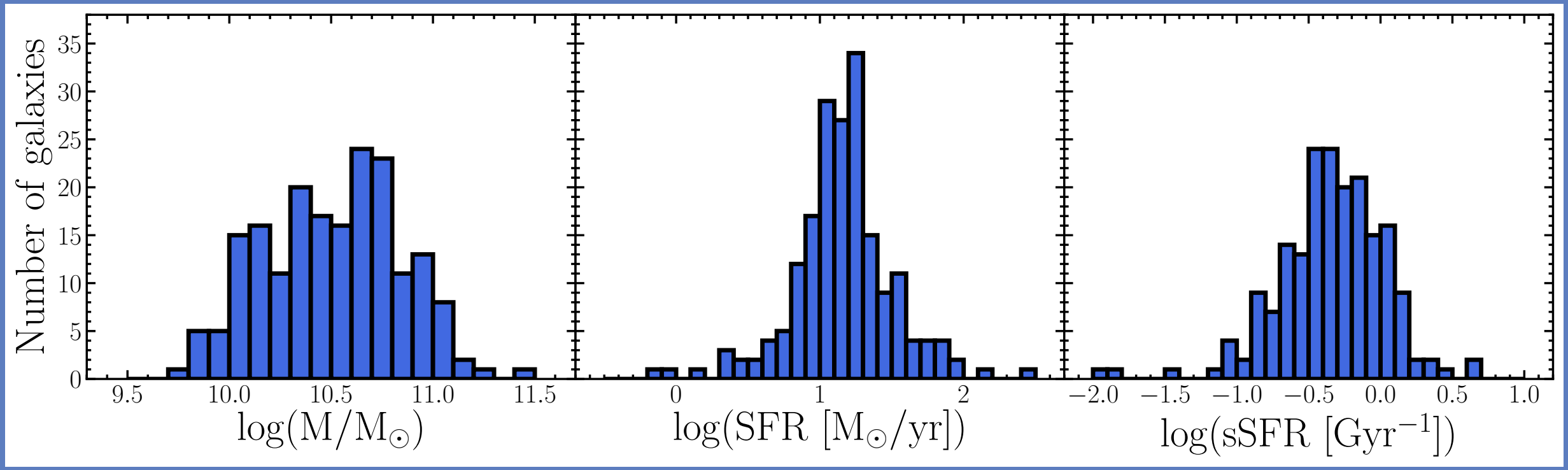
Plot from Richards+2006

Sample

Large Early Galaxy Census (LEGA-C)

- Public spectroscopic galaxy survey
- Consists of ~3200 K-band selected $0.6 < z < 1.0$ galaxies
- Data from the Visible Multi-Object Spectrograph (VIMOS) on the Very Large Telescope (VLT)
- Looks at the physical conditions of $0.6 < z < 1.0$ galaxies to better connect the galaxy populations at $z \sim 2$ and $z \sim 0$

Bulk Galaxy Properties of LEGA-C

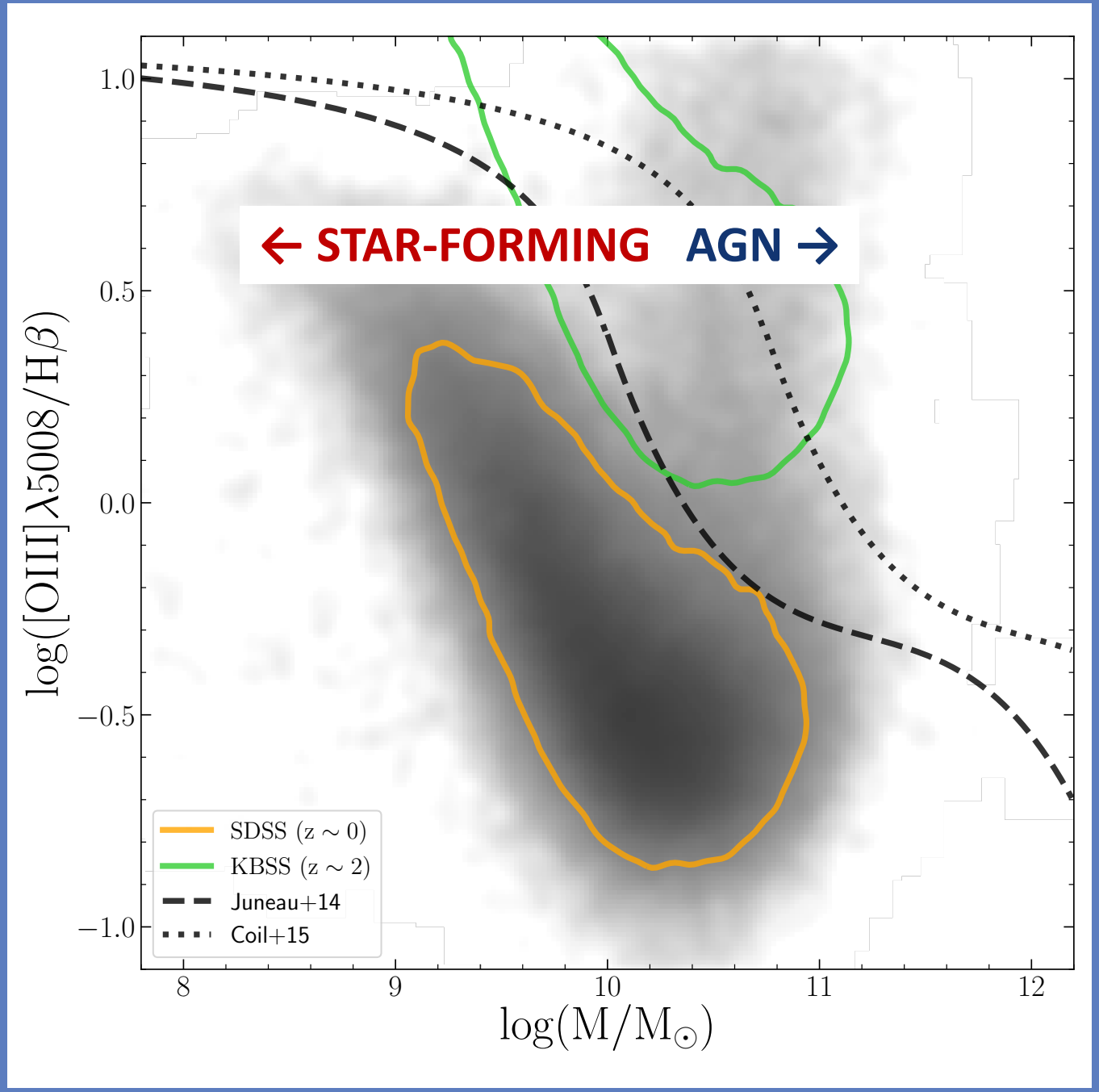


Data from van der Wel+2016

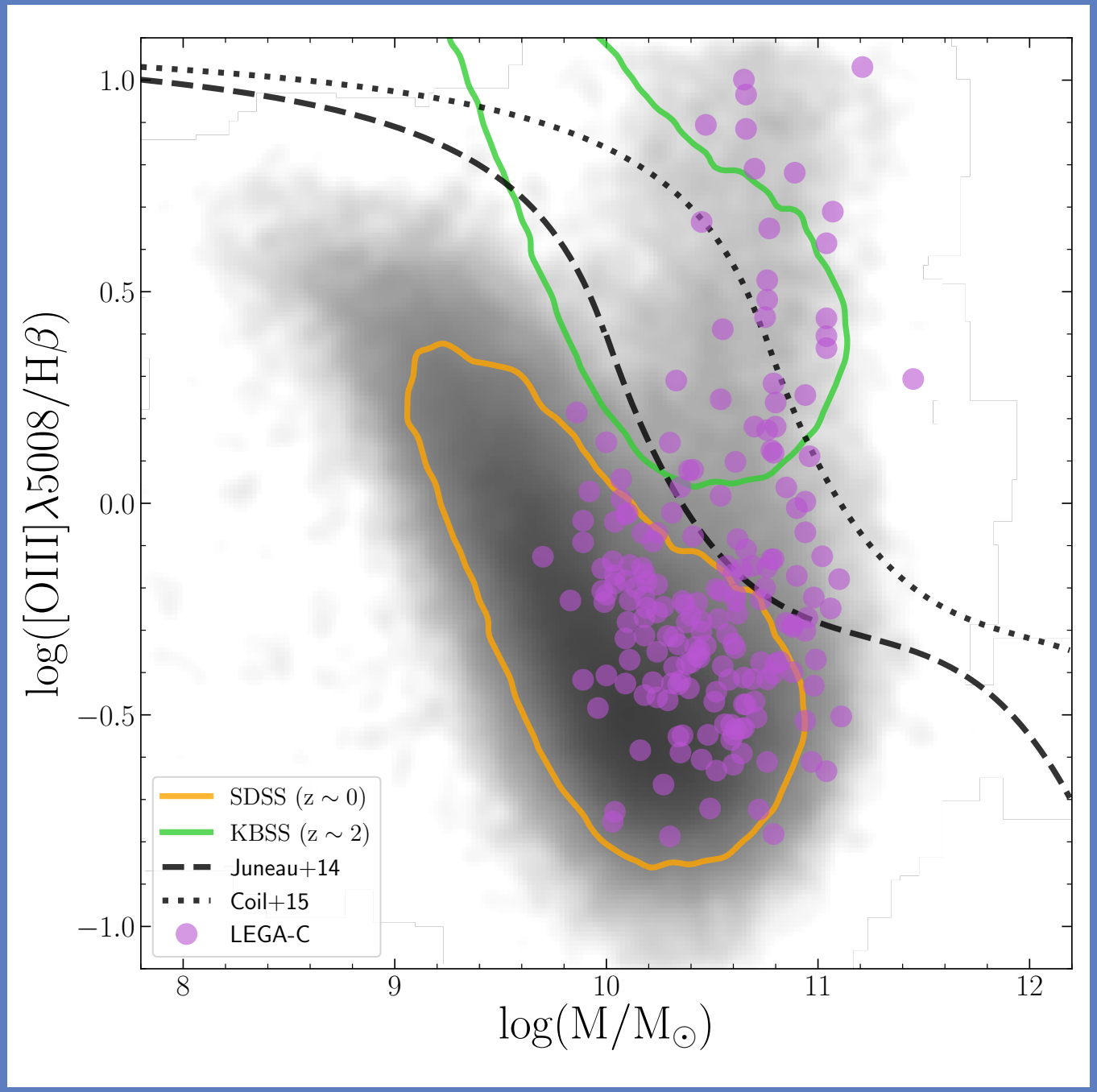
Reference Galaxy Samples at $z \sim 0$ and $z \sim 2$

- Sloan Digital Sky Survey (SDSS)
  - Multi-spectral imaging and spectroscopic redshift survey
  - $\sim$ 30,000 galaxies at $z \sim 0$ are used here
- Keck Baryonic Structure Survey (KBSS)
  - Spectroscopic galaxy survey
  - $\sim$ 350 galaxies at $z \sim 2$ are used here

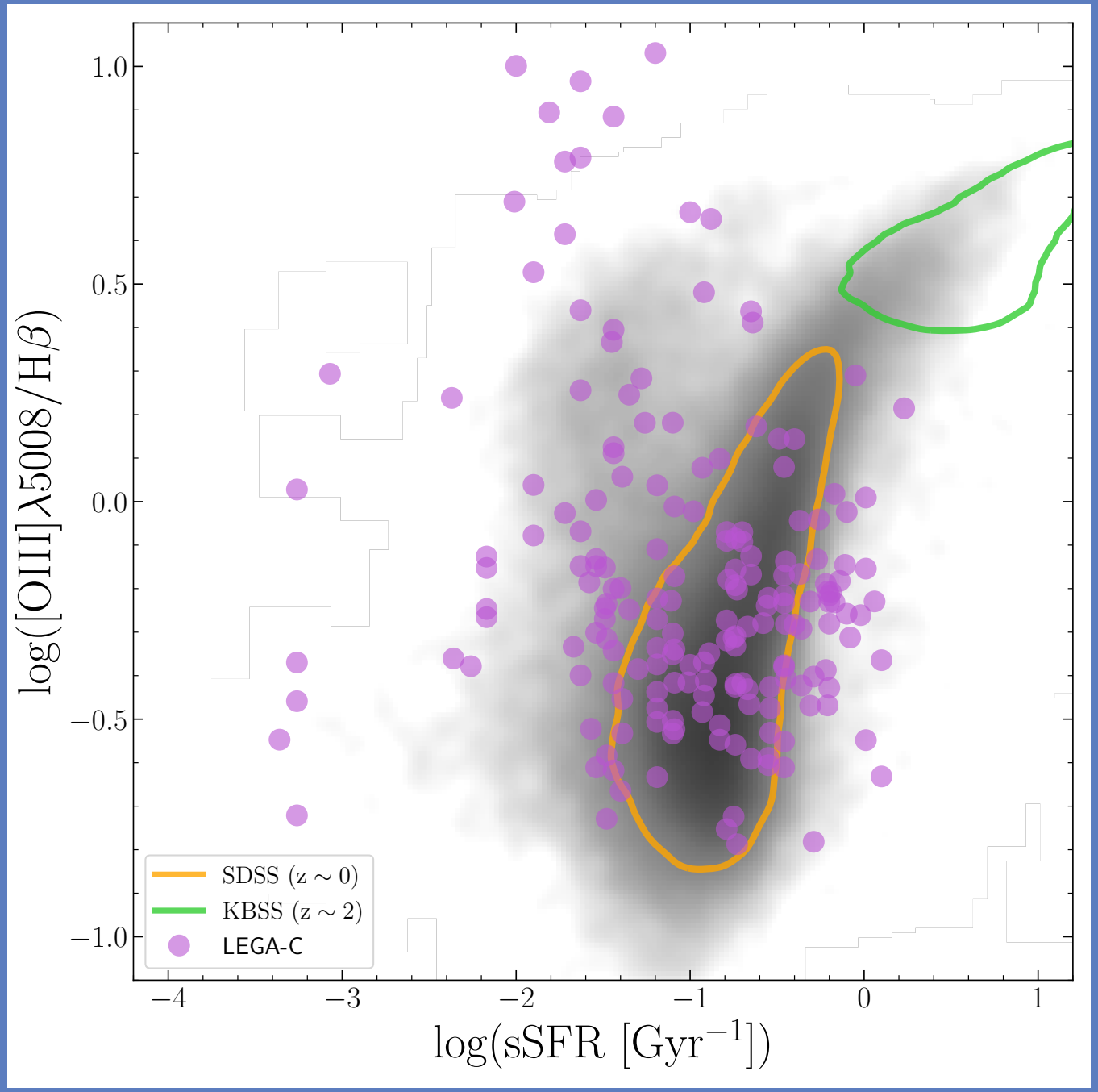
Mass-Excitation Diagram



Mass-Excitation Diagram



sSFR-Excitation Diagram

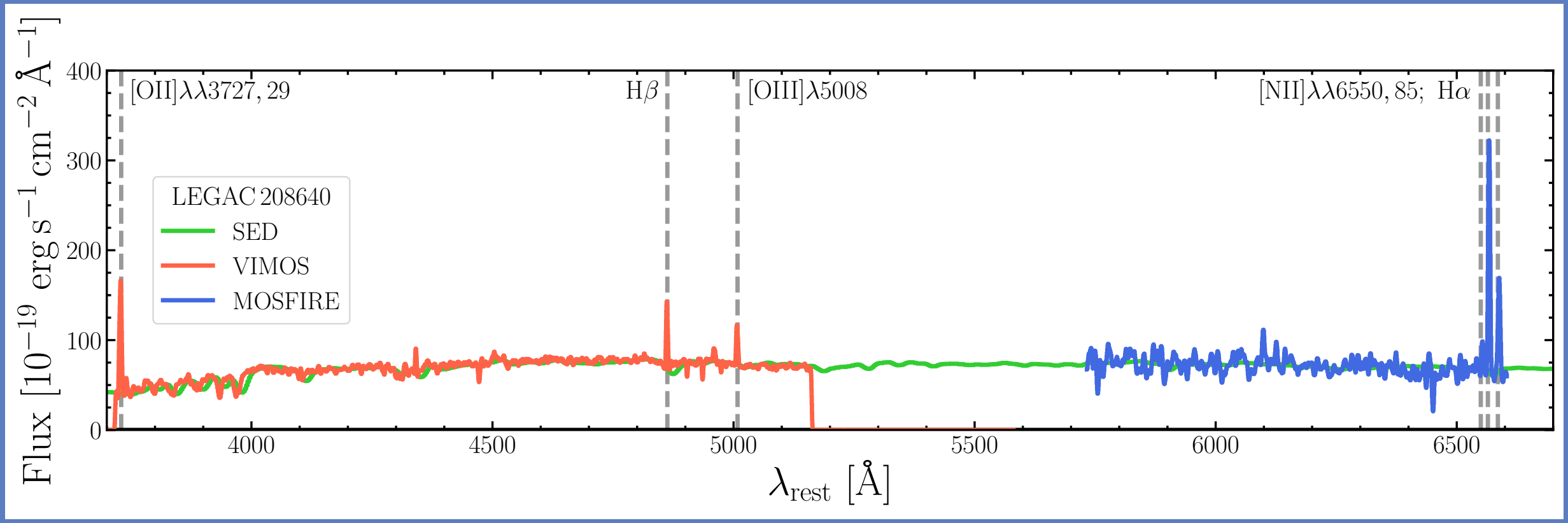


Further Analysis

Our Subsample of LEGA-C Galaxies

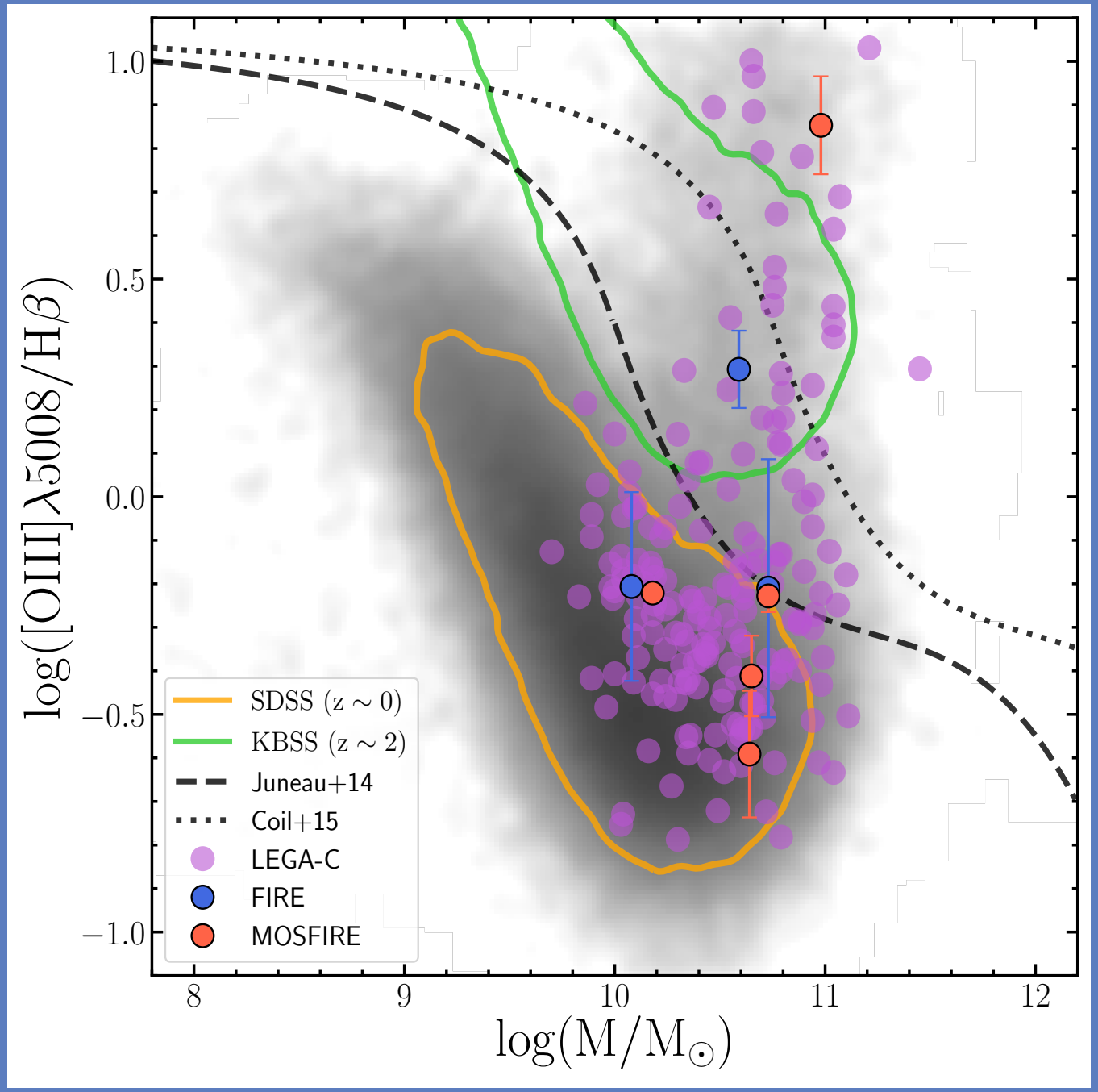
- Consists of 19 LEGA-C galaxies
- Data from the Folded-port Infrared Echellette (FIRE) on the Magellan Baade Telescope and the Multi-Object Spectrometer for Infrared Exploration (MOSFIRE) on the Keck I Telescope
- Our subsample consists of 10 galaxies with significant detection of Hβ, [OIII]λ5008, Hα, and [NII]λ6586

VIMOS + FIRE/MOSFIRE

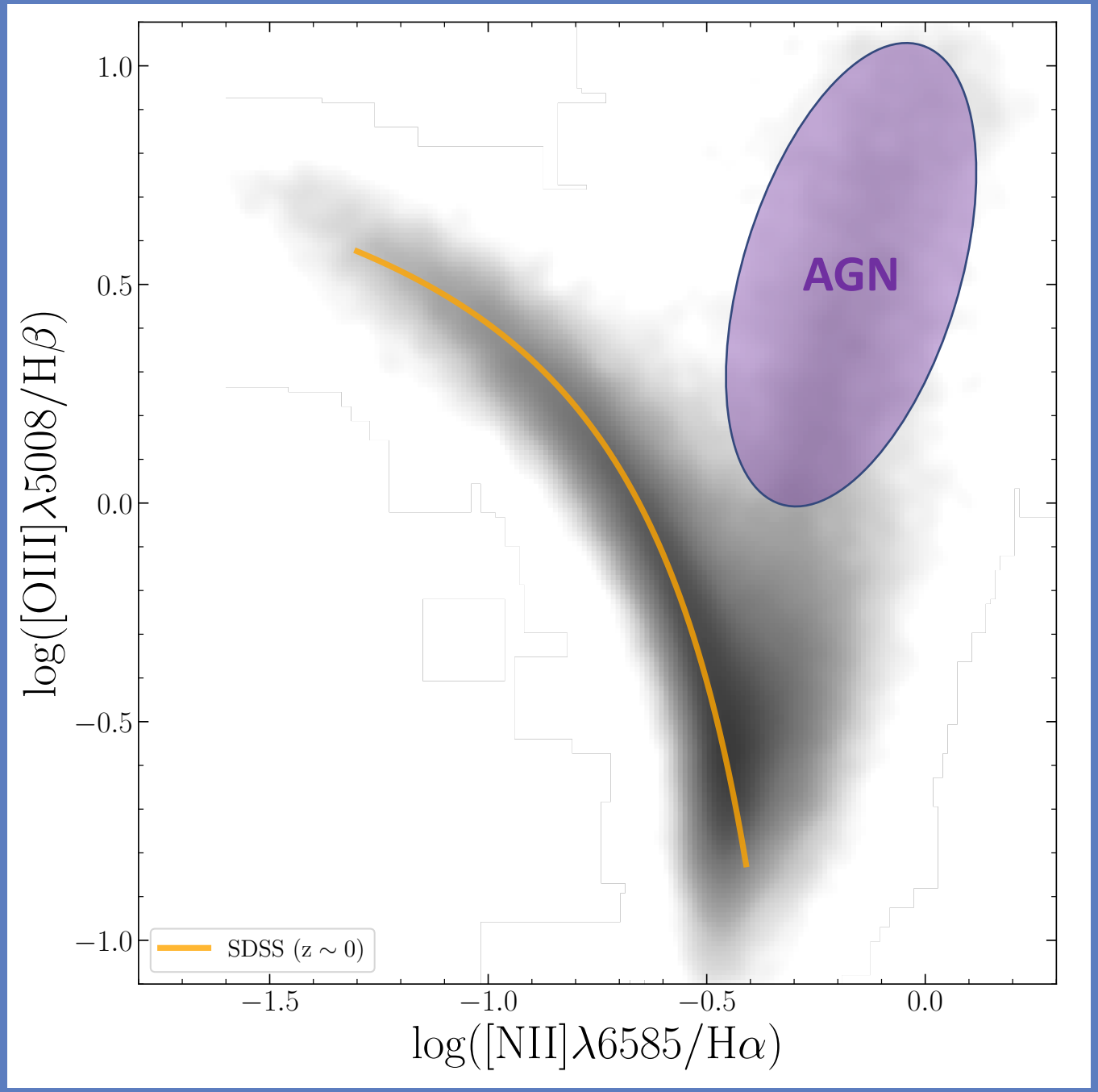


Results from VIMOS+FIRE/MOSFIRE

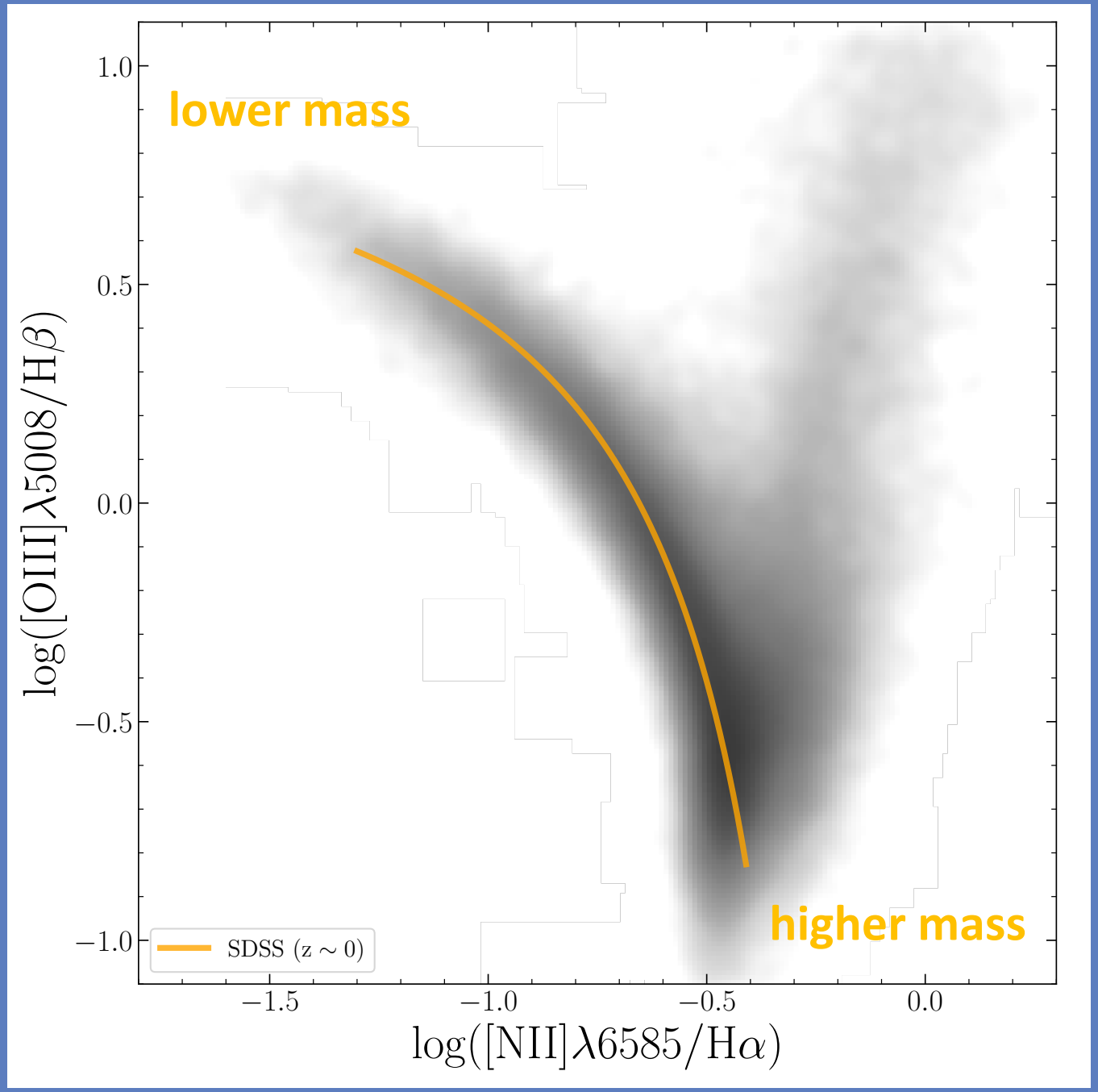
Mass-Excitation Diagram



N2-BPT Diagram



N2-BPT Diagram



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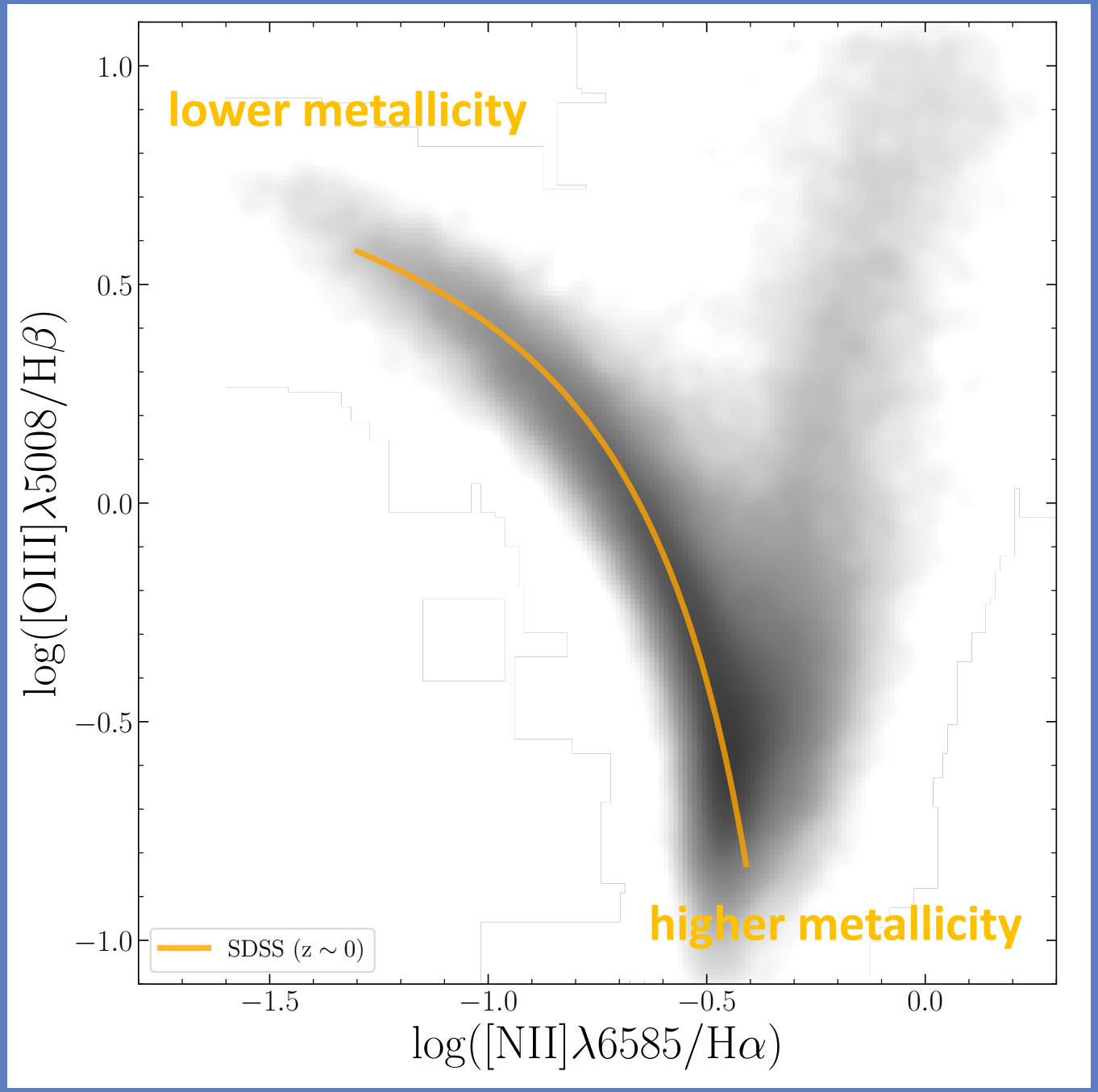

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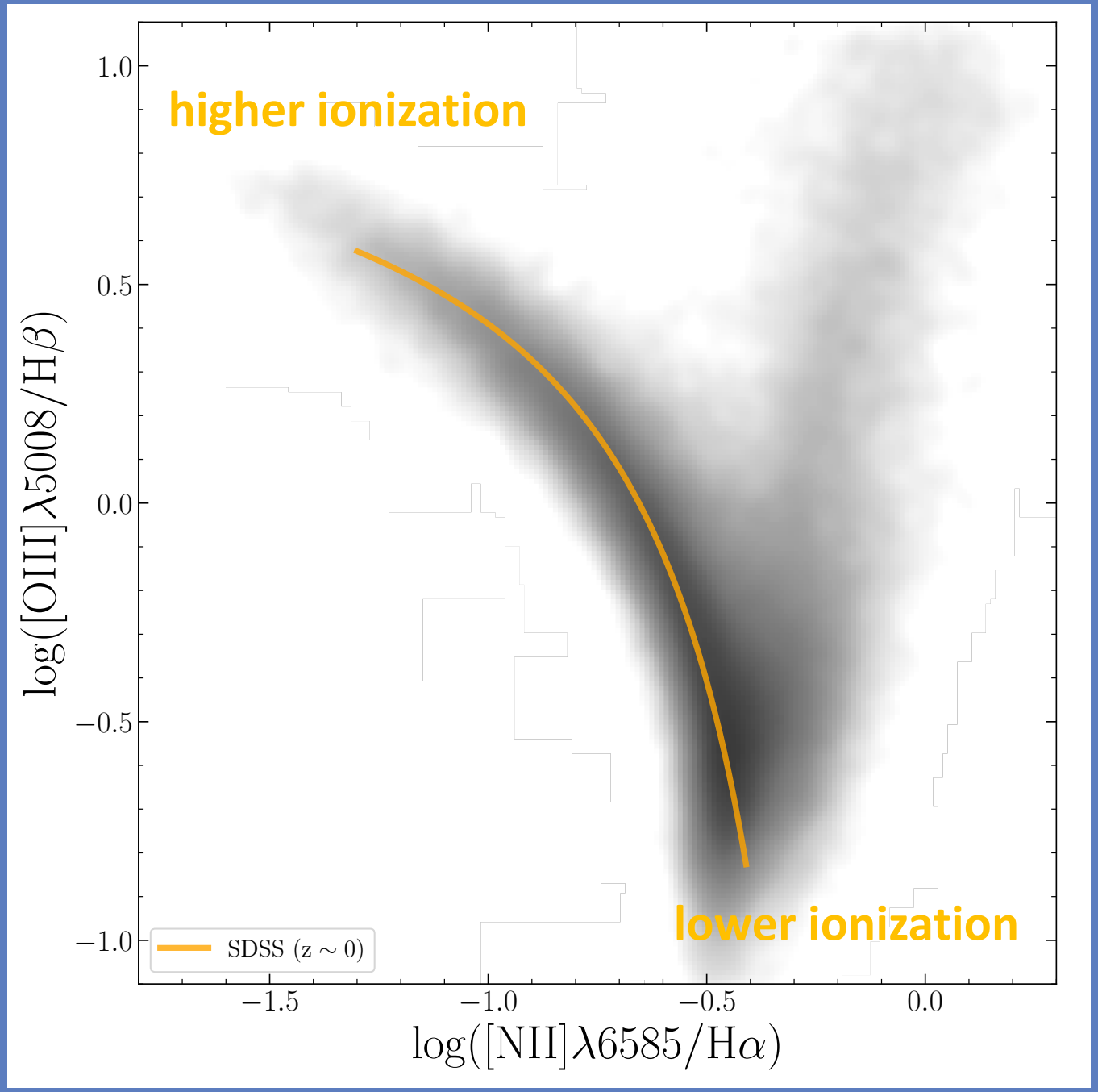

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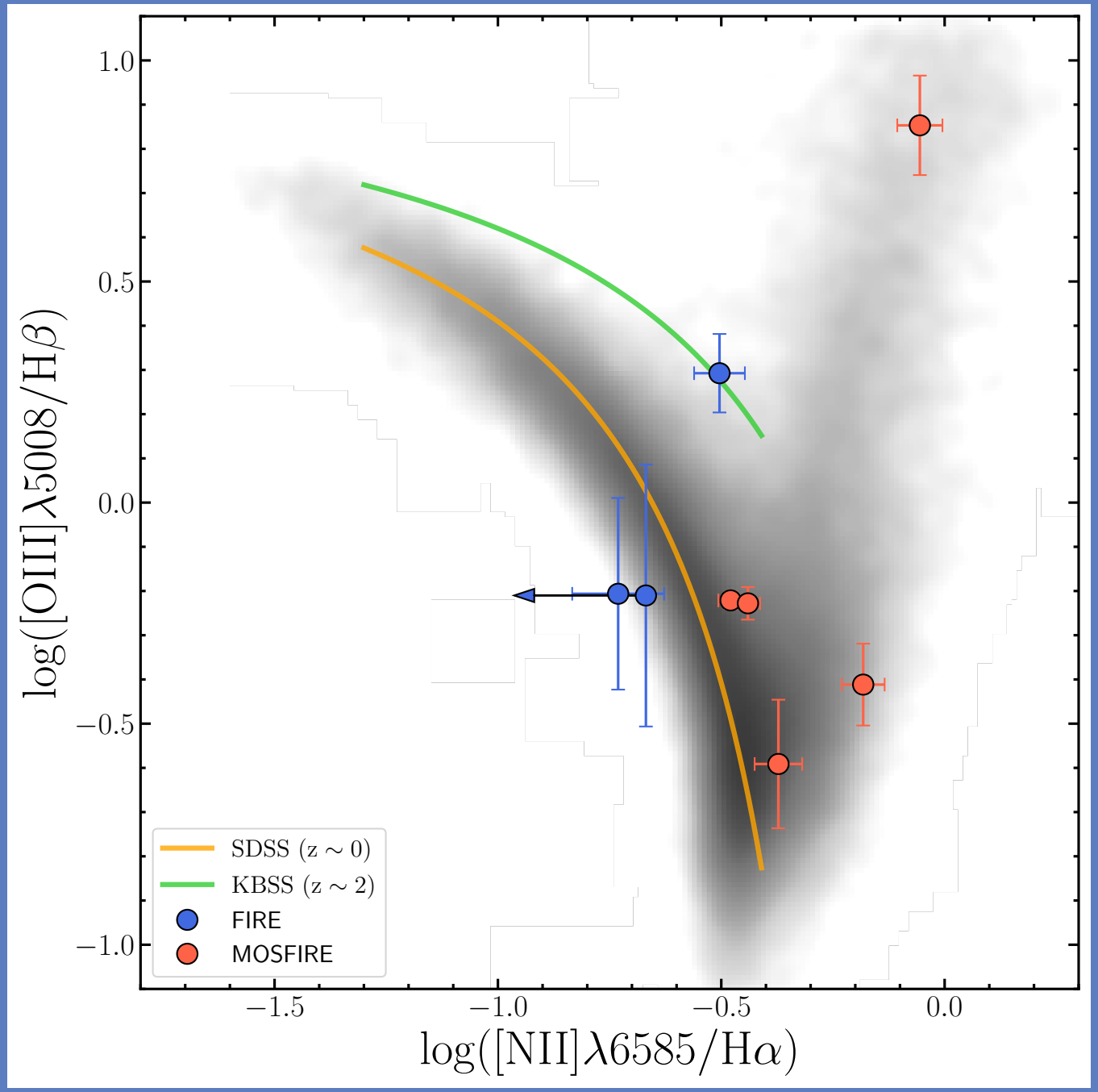
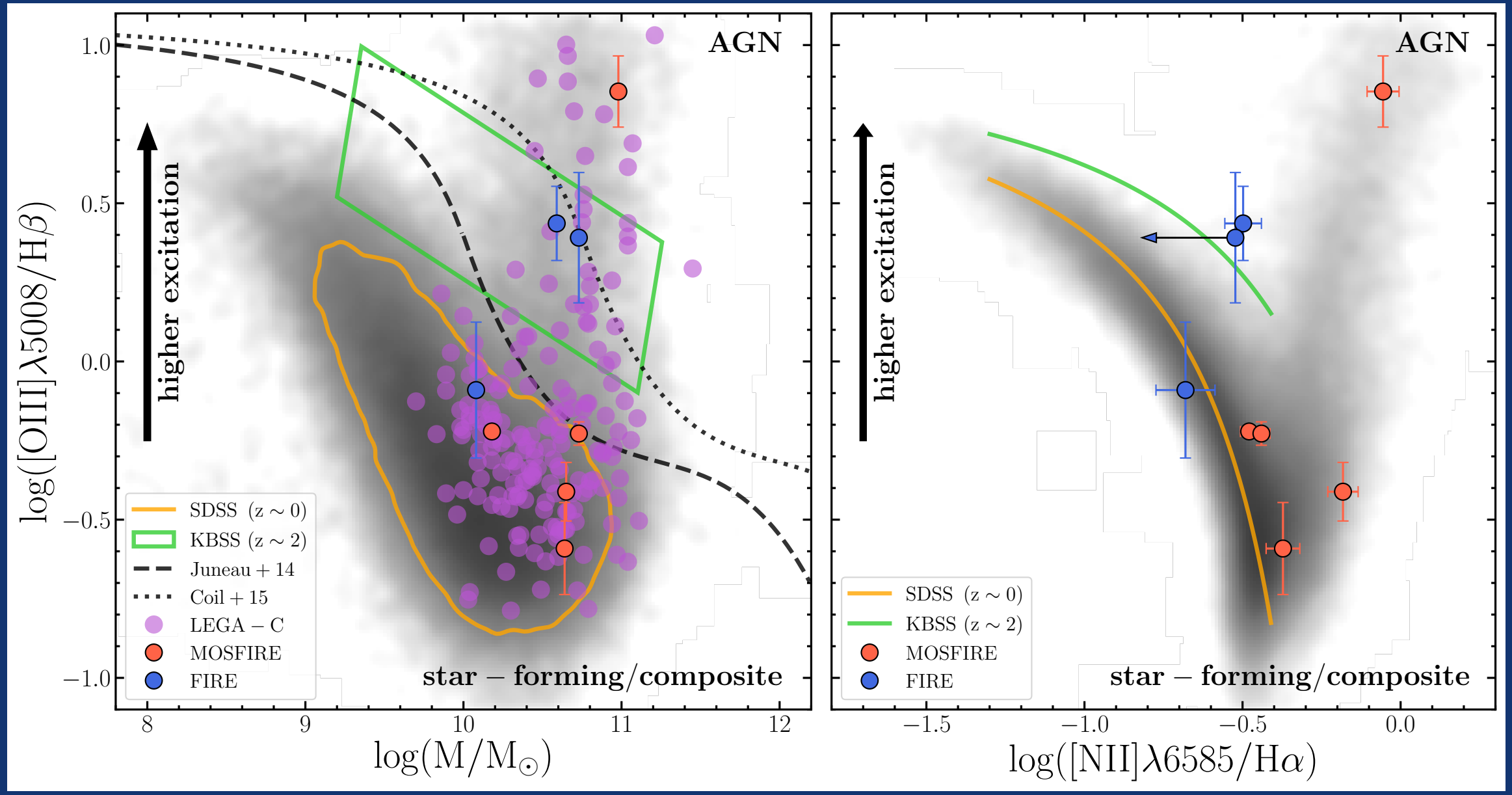


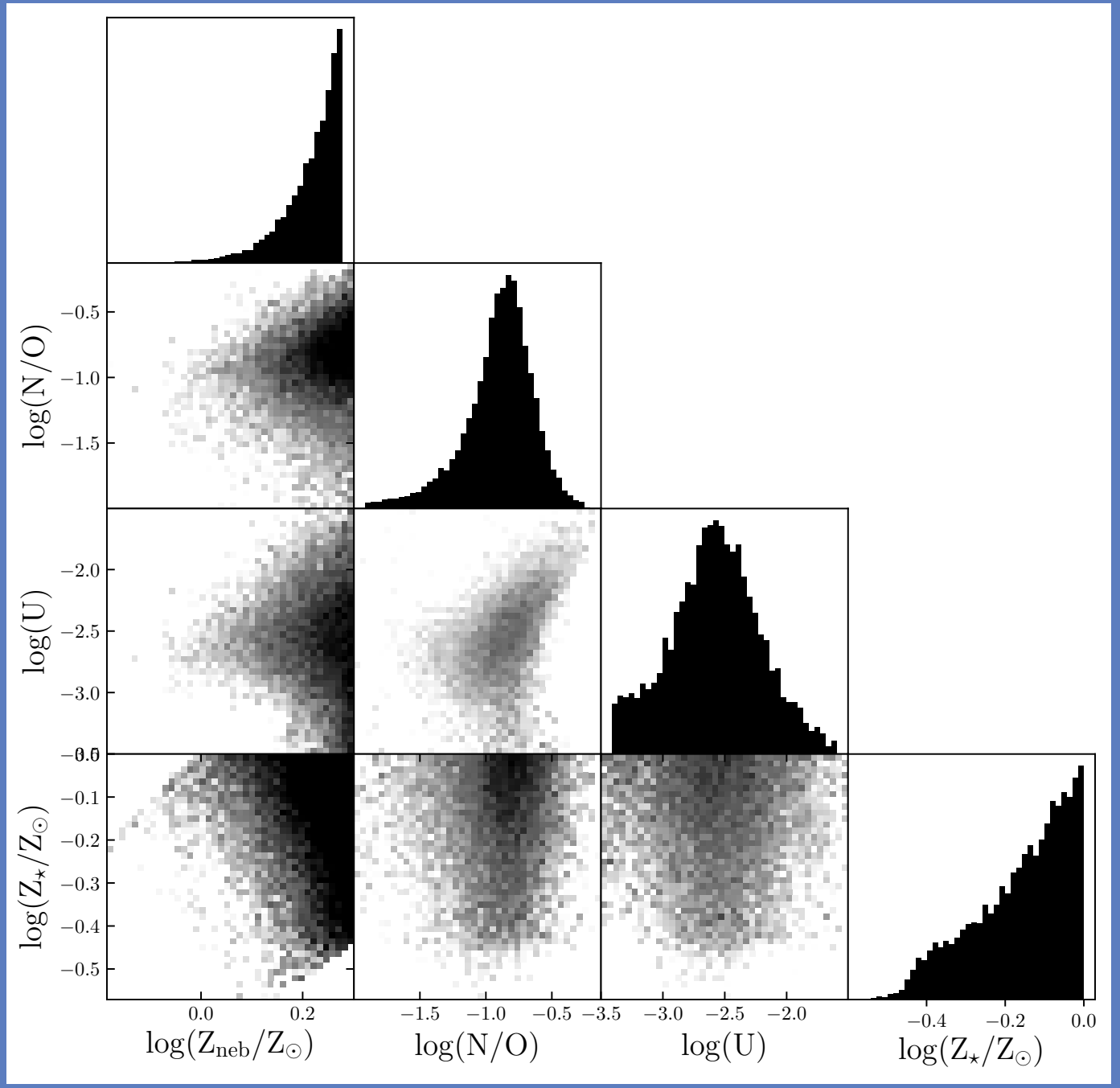

AGN
higher excitation
star − forming/composite
SDSS (z ∼ 0)
KBSS (z ∼ 2)
Juneau + 14
Coil + 15
LEGA − C
MOSFIRE
FIRE
log([OIII]λ5008/Hβ)
log(M/M⊙)
log([NII]λ6585/Hα)
1.0
0.5
0.0
−0.5
−1.0
8
9
10
11
12
−1.5
−1.0
−0.5
0.0

Conclusions

During the transition period of $0.6 < z < 1.0$, galaxies are more similar to $z \sim 0$ galaxies than $z \sim 2$ galaxies, while still showing somewhat higher nebular ionization and excitation at fixed stellar mass when compared to $z \sim 0$ galaxies.

Current and Future Work

Photoionization Modeling with Cloudy



Photoionization Modeling with Cloudy

- Utilizing cloudy in a similar approach to Strom+2018
- Plane parallel geometry with $n_H \sim 300$ cm^{-3}
- Dust grains are included
- Stellar population synthesis models from BPASSv2 set the shape of the ionizing spectra
- Parameter space: $Z_*/Z_\odot$ = [0.07, 1.00], $Z_{neb}/Z_\odot$ = [0.1, 2.0], log(U) = [-3.5, -1.5], log(N/O) ≥ -1.8