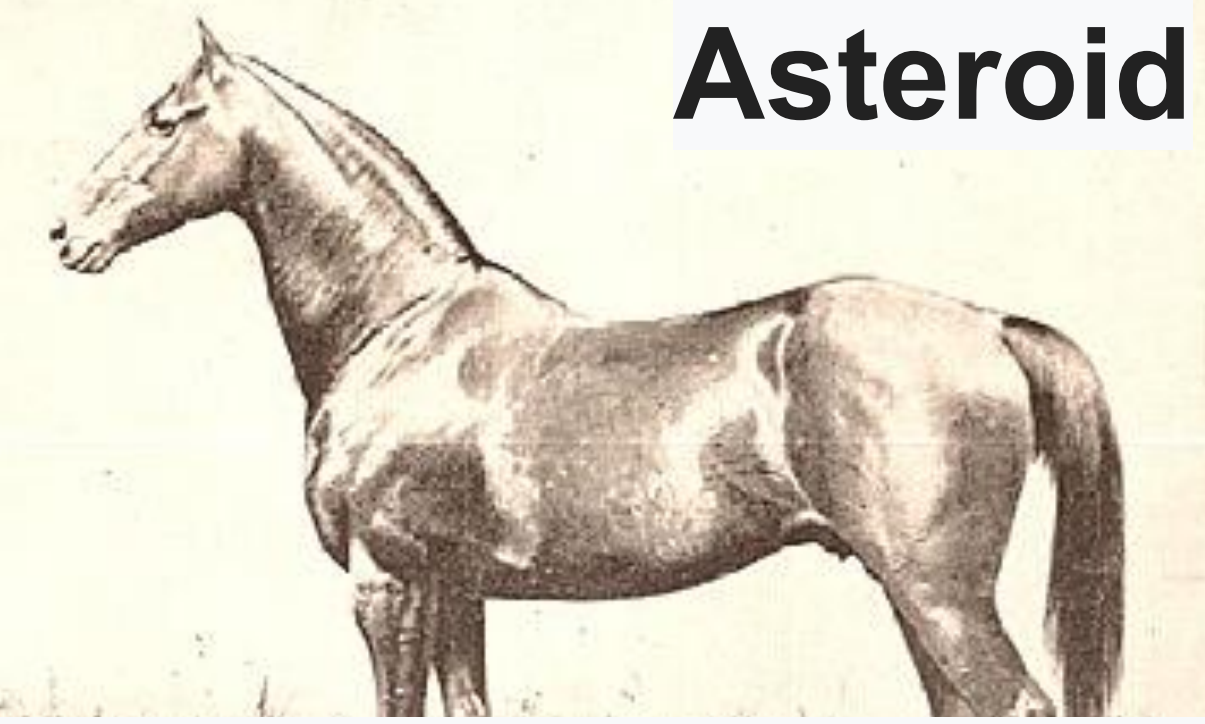


# DERBIES: Diagnostics of Escaping Radiation from Bright Infrared Emitting Starbursts

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Asteroid

“By Lexington from Nebula”  
-Gooreen Collection

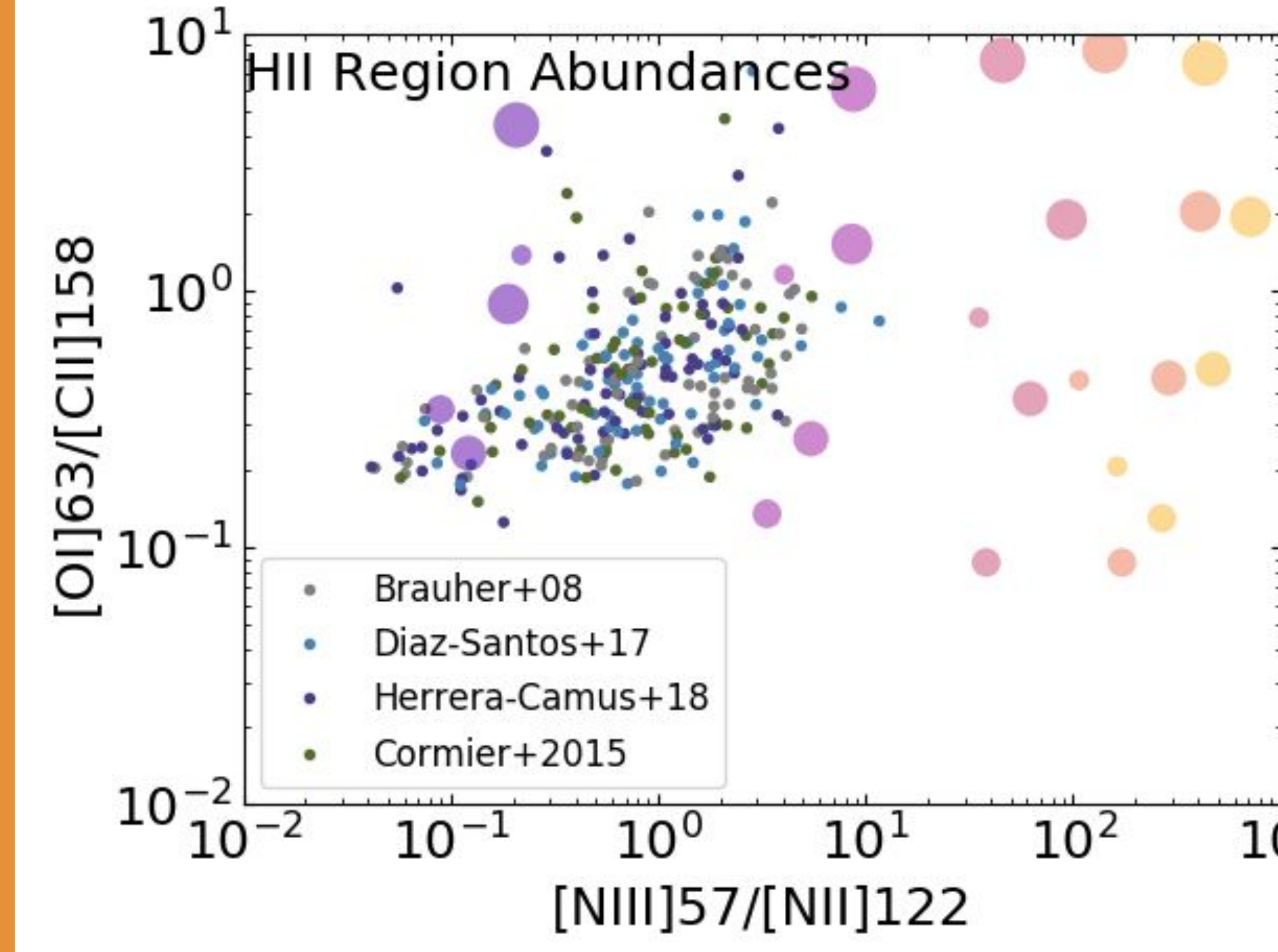
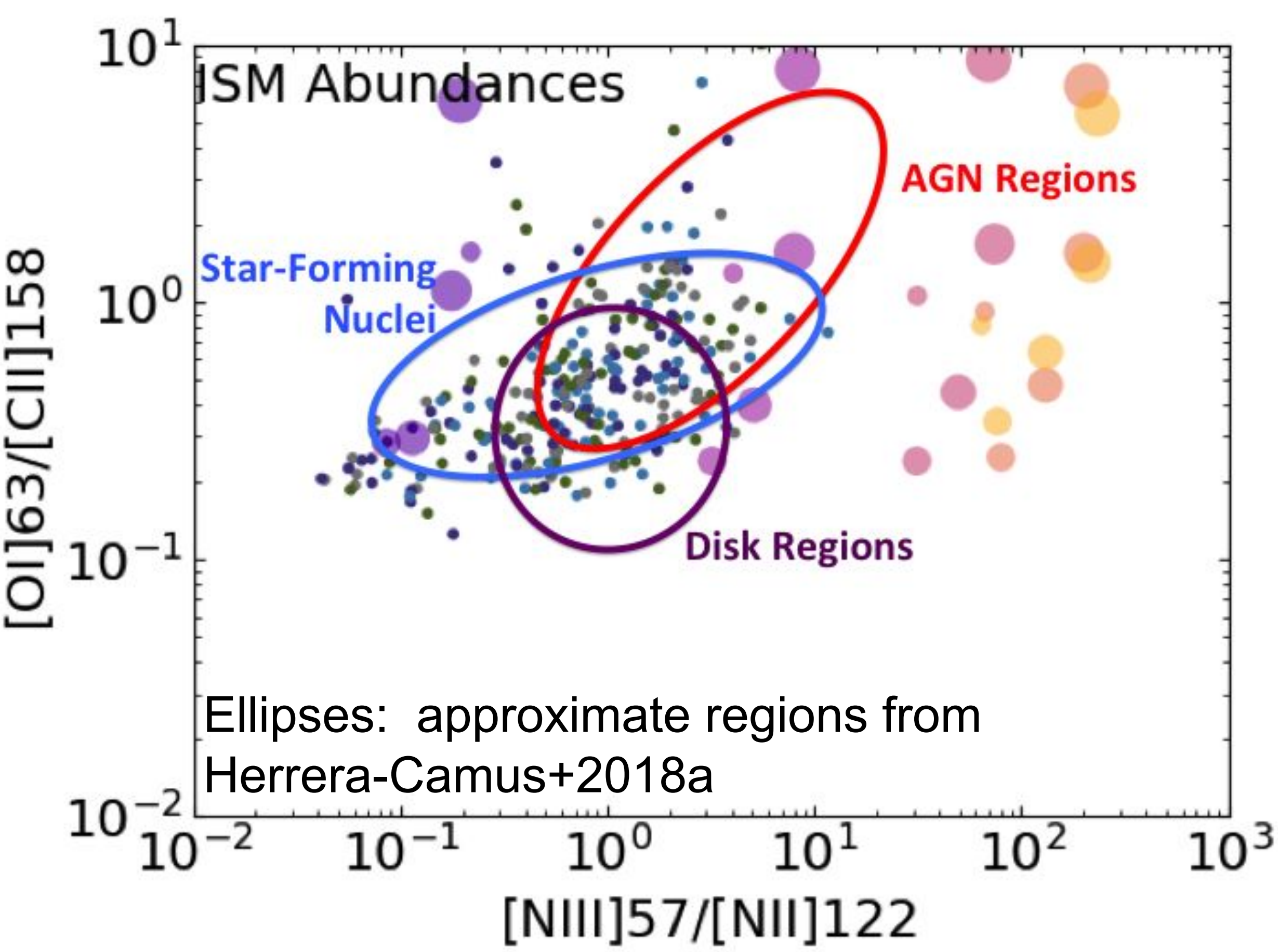
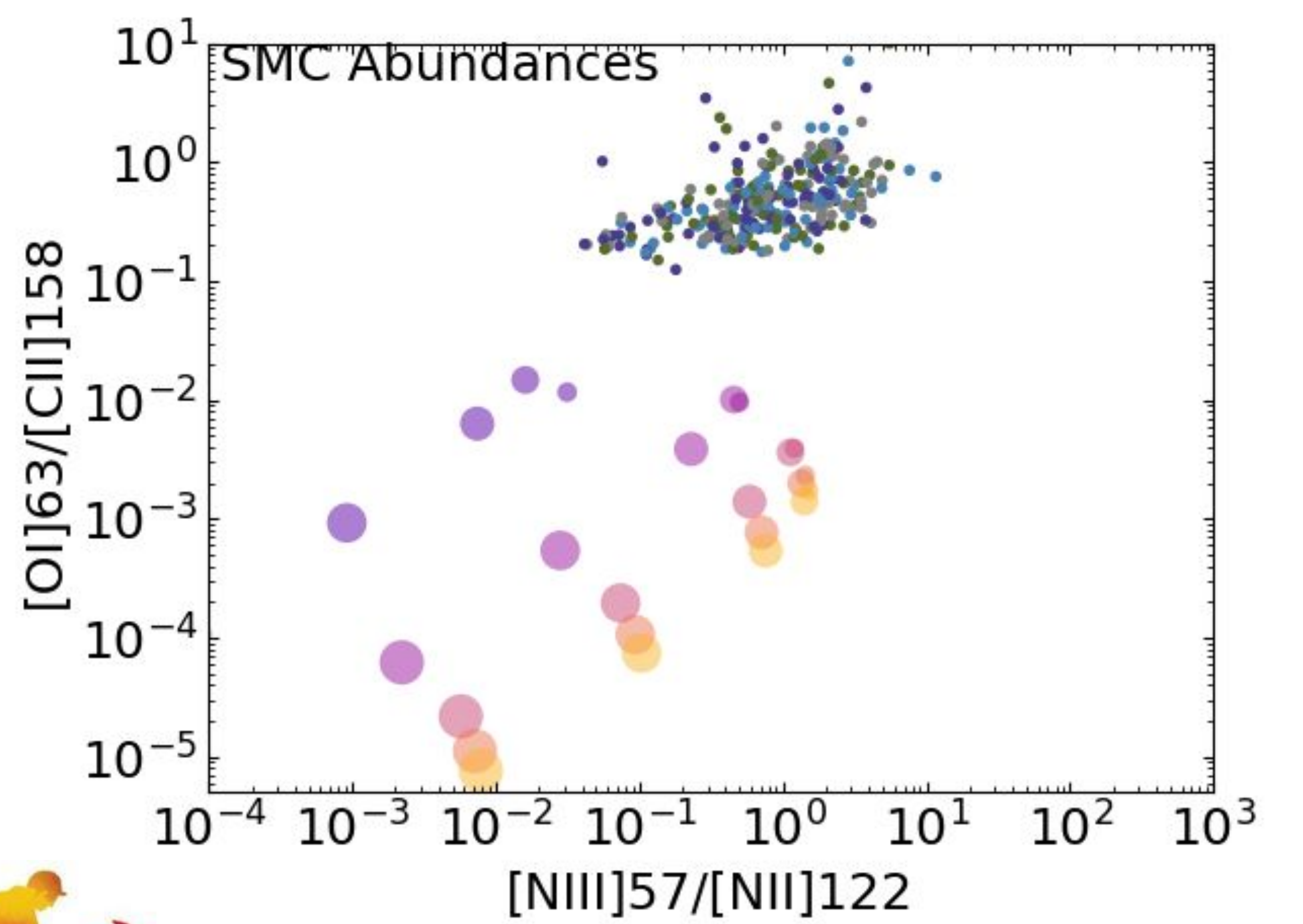
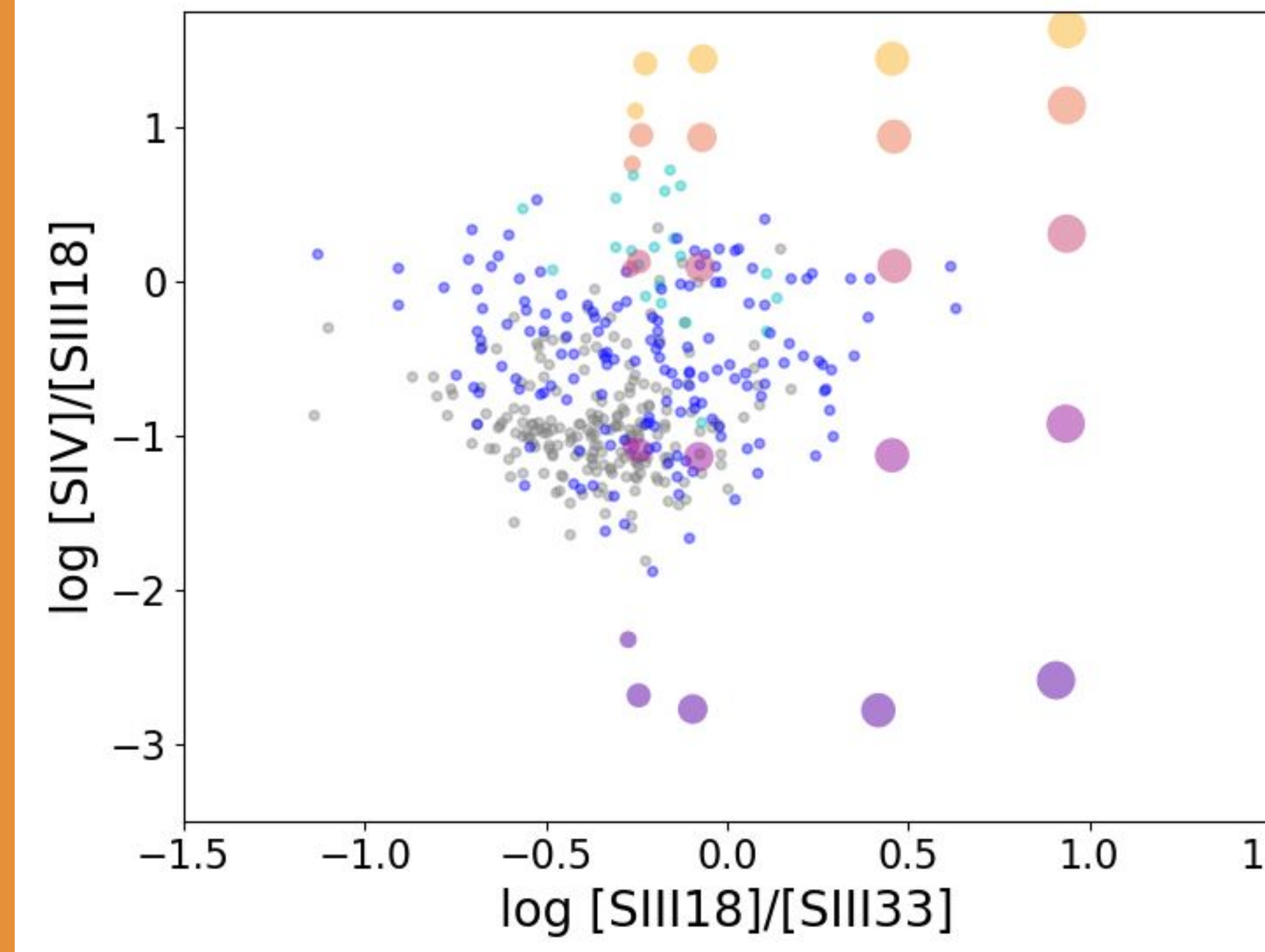
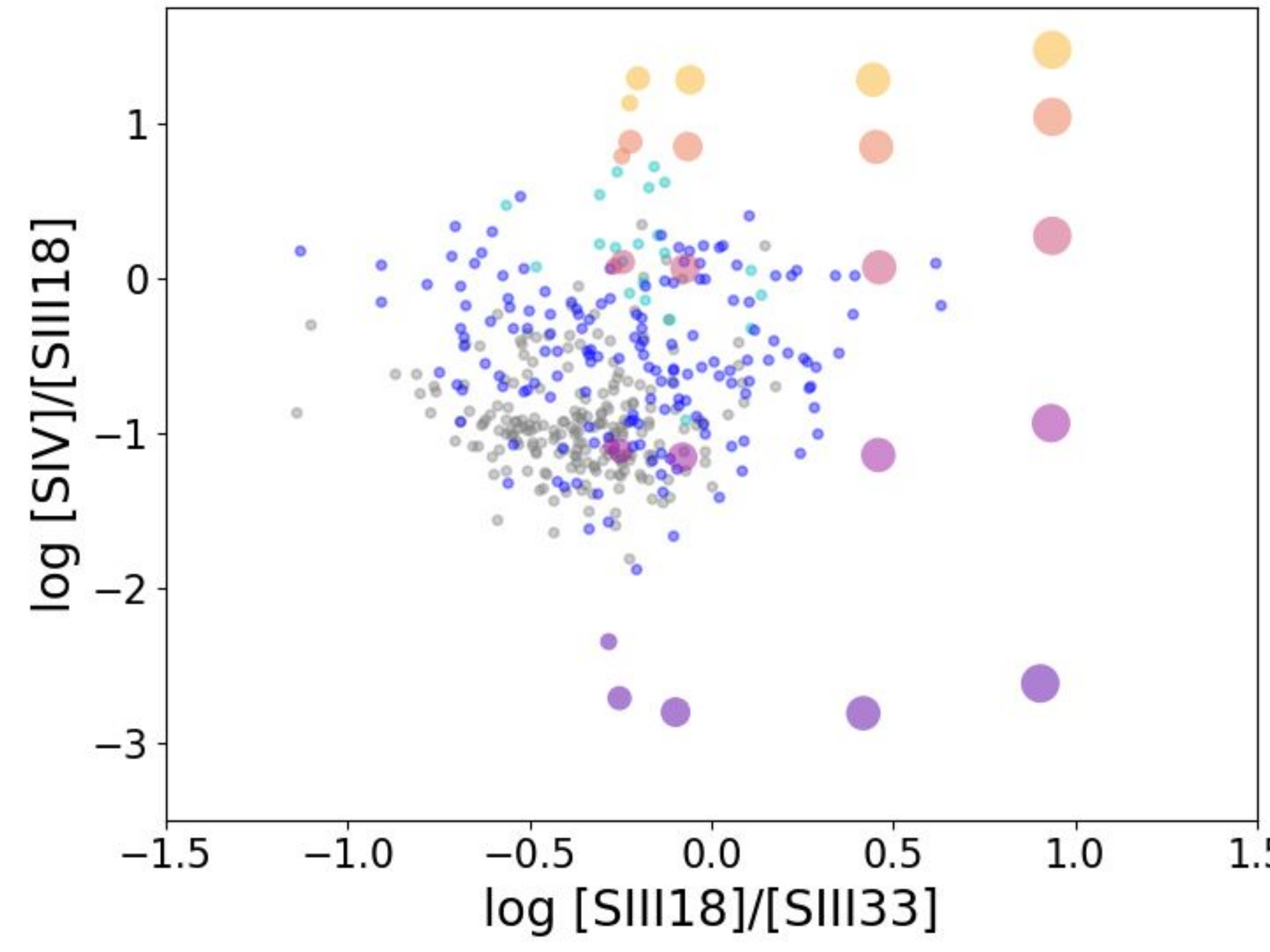
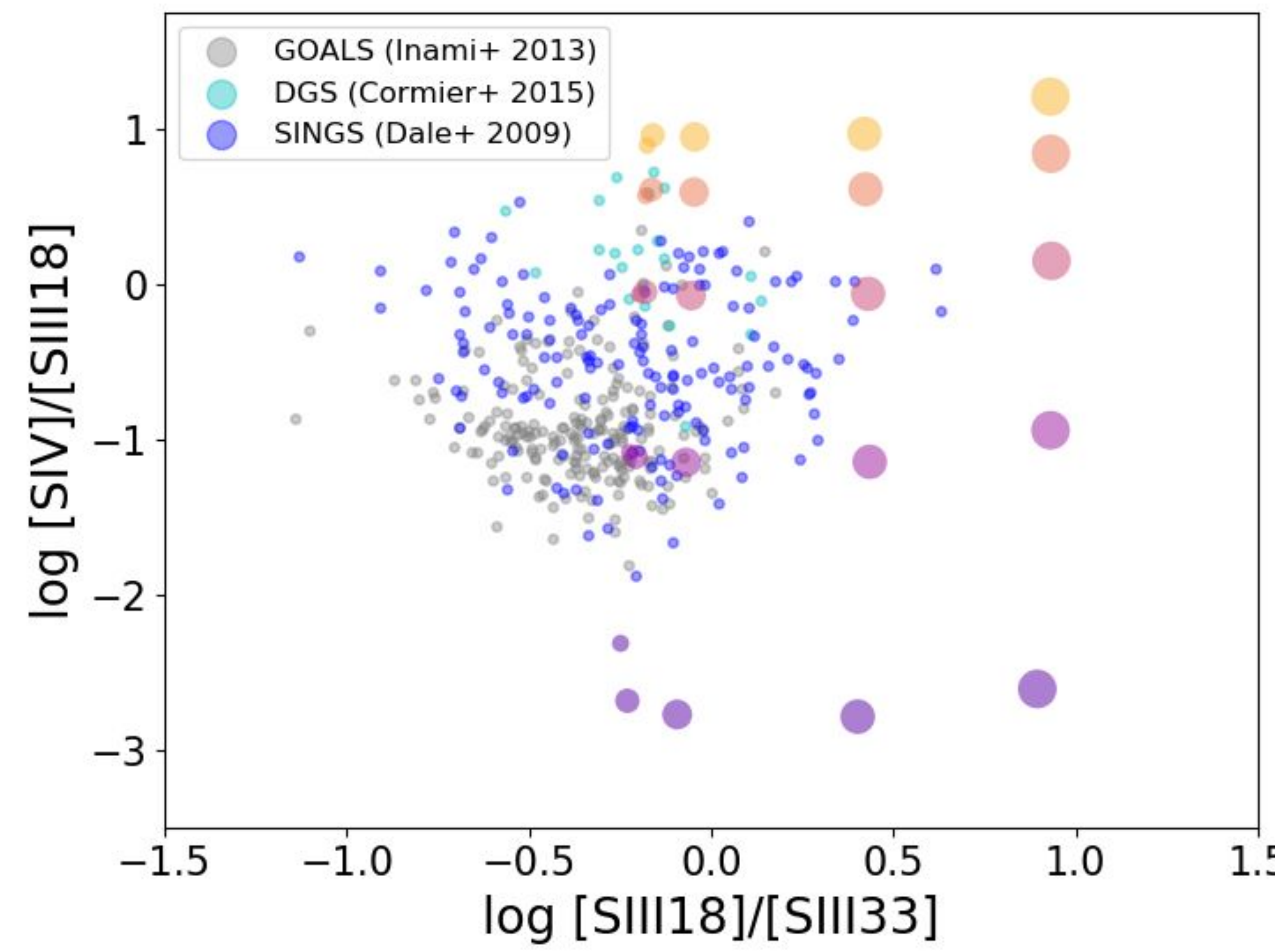
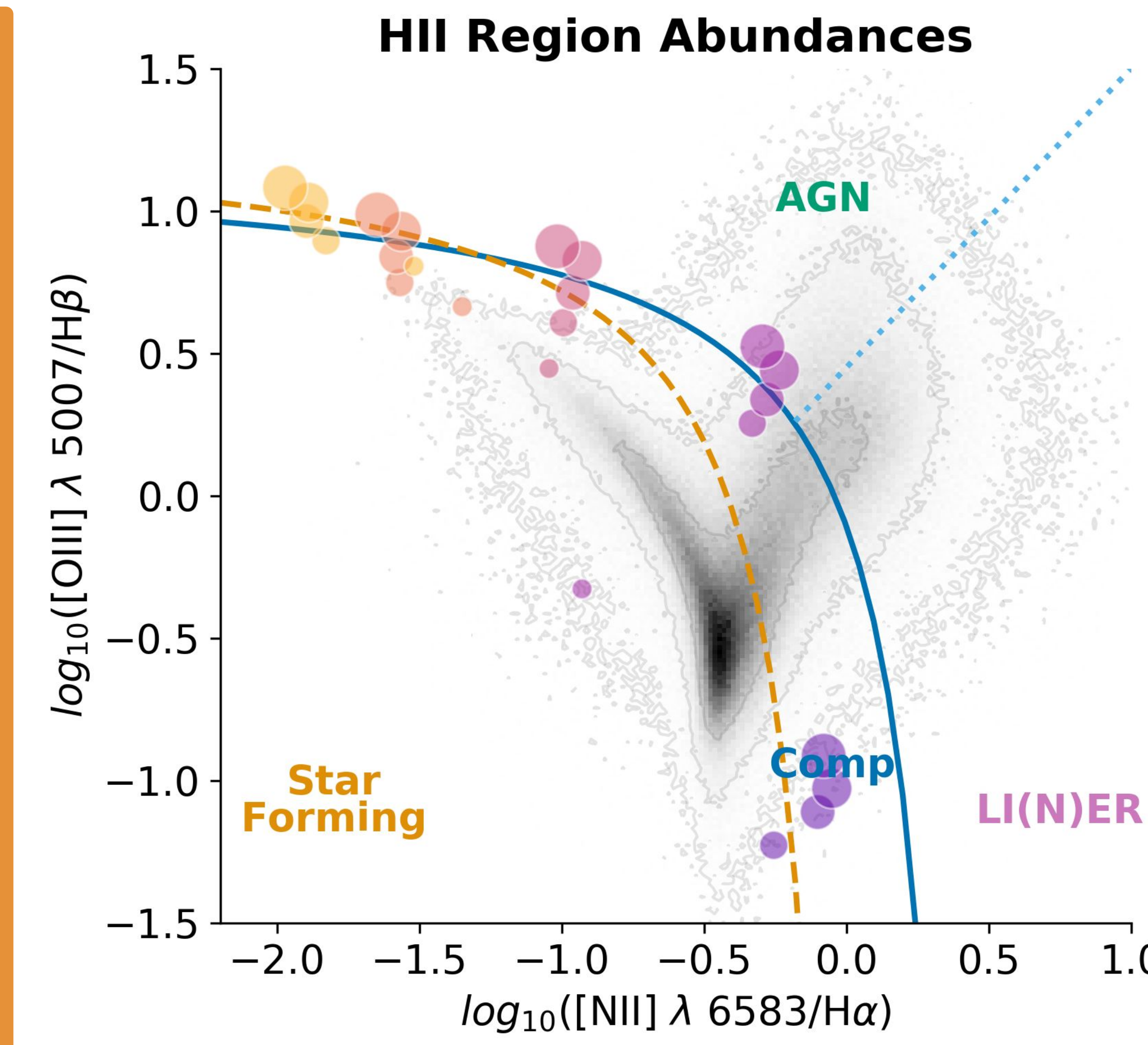
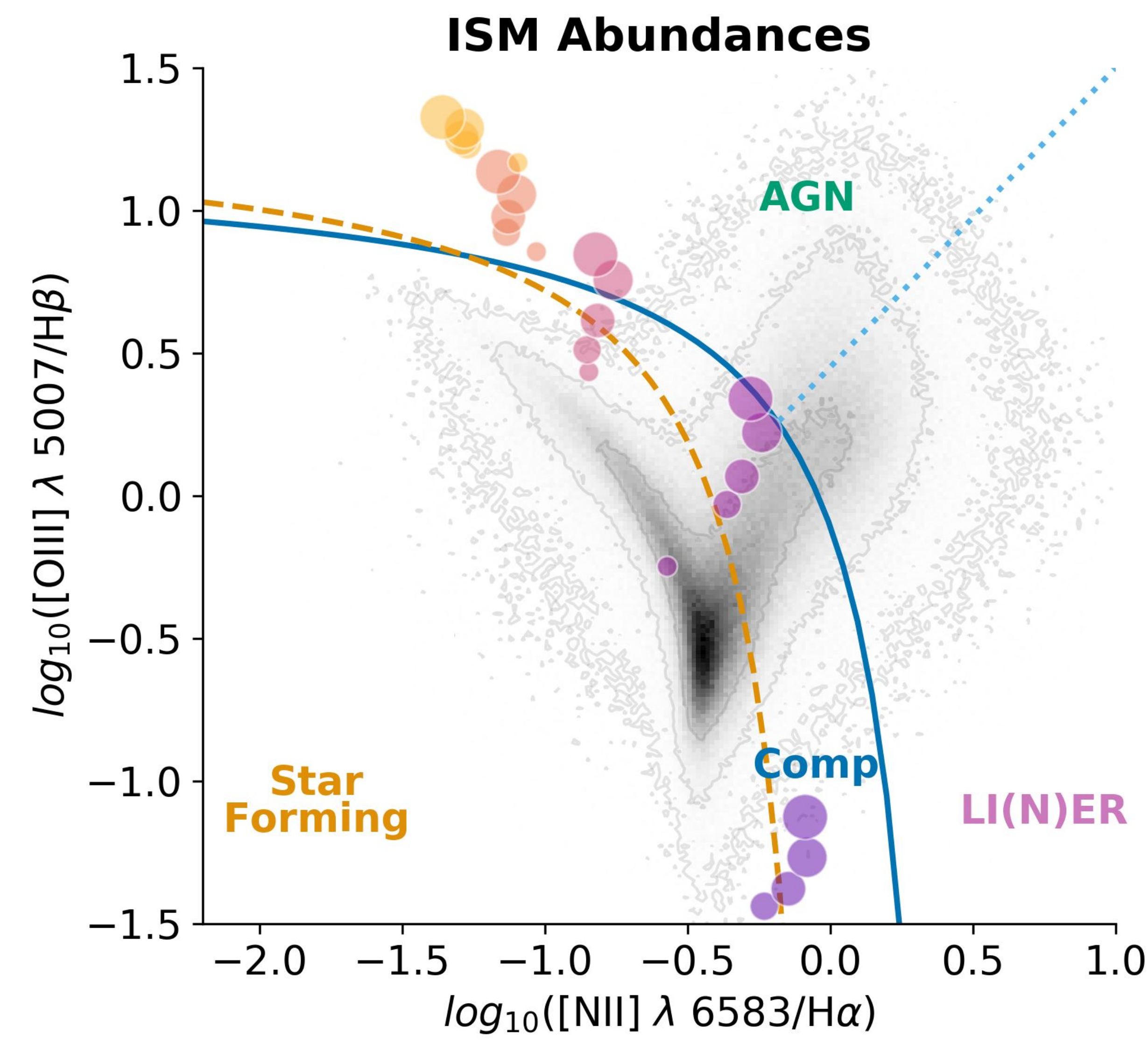
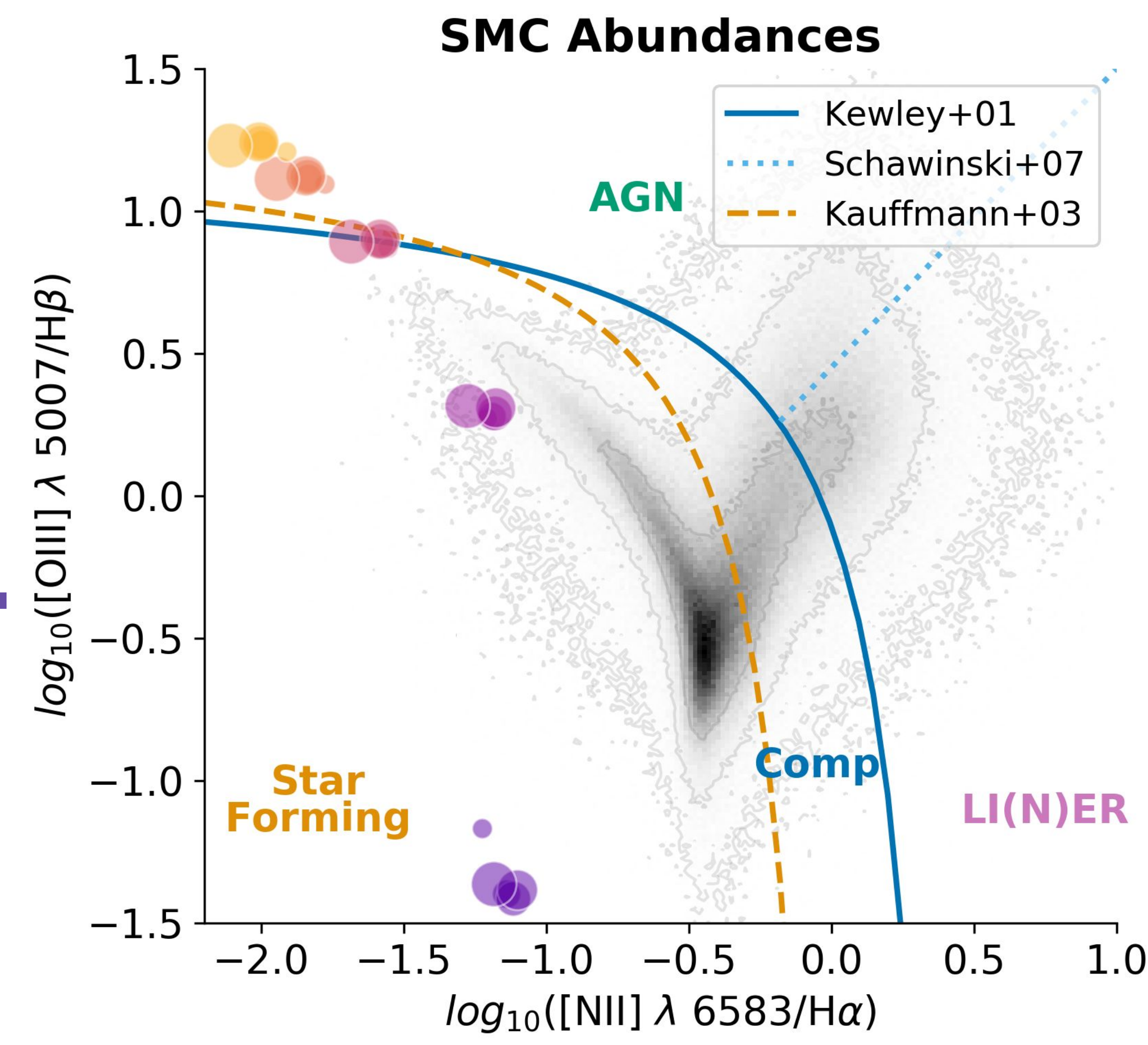
## Overview:

- Central Starburst
  - Kroupa IMF
  - soft X-ray source
  - Gas at 0.5 kpc
  - 10 Myr ages
- 3 Metallicities
  - SMC - ISM - HII
- 3 Wavelengths
  - Optical
  - Mid-IR
  - Far-IR

Optical

Mid-IR

Far-IR



**Optical Line Diagnostics:**  
BPT Diagrams identify the ionization and excitation mechanism of gas

- Greyscale: SDSS DR7 Galaxies
- Colored Points: from Cloudy

**Findings:**

- [NII]/H $\alpha$  is most sensitive to metallicity - increase with inverse U
- [OIII]/H $\beta$  weak metallicity dependence - increase with U

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**MIR Line Diagnostics:**  
[SIII18]/[SIII33] traces the density  
[SIV]/[SIII18] traces the ionization parameter and SED

**Findings:**

- Density limit reached at a [SIII18]/[SIII33] ratio of  $\sim -0.25$
- Data consistent with  $\log U \sim -3-2$  and  $\log n(H) \sim 0.5 - 2.5$
- Both line ratios have little dependence on metallicity

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**FIR Line Diagnostics:**  
[NIII]57/[NII]122 vs [OI]63/[CII]158 may distinguish emission from AGN vs star-forming vs disk regions

**Findings:**

- [NIII]57/[NII]122 increases with U
- [OI]63/[CII]158 varies with H density
- At low metallicities, [OI]63/[CII]158 increases with inverse U and both ratios increase with inverse H density

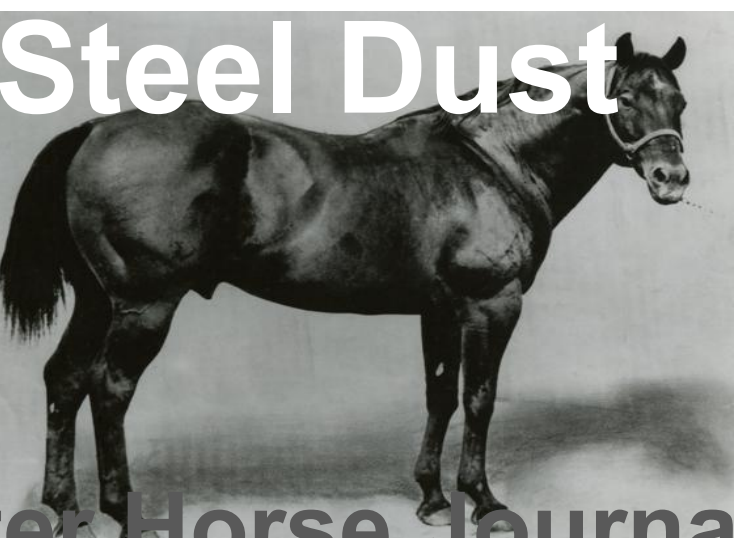
$\log_{10}(n(H))$     $\log_{10}(U)$   
 -4   -3   -2   -1   0  
  
 4.5 Ionization  
 3.5 Parameter  
 2.5 Color  
 1.5 Total Hydrogen Density  
 0.5 Point Size



SMC

ISM

HII



Steel Dust