Comparisons of Dust, Molecular Gas, and Atomic Gas in NGC 2403

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JCMT Nearby Galaxies Legacy Survey

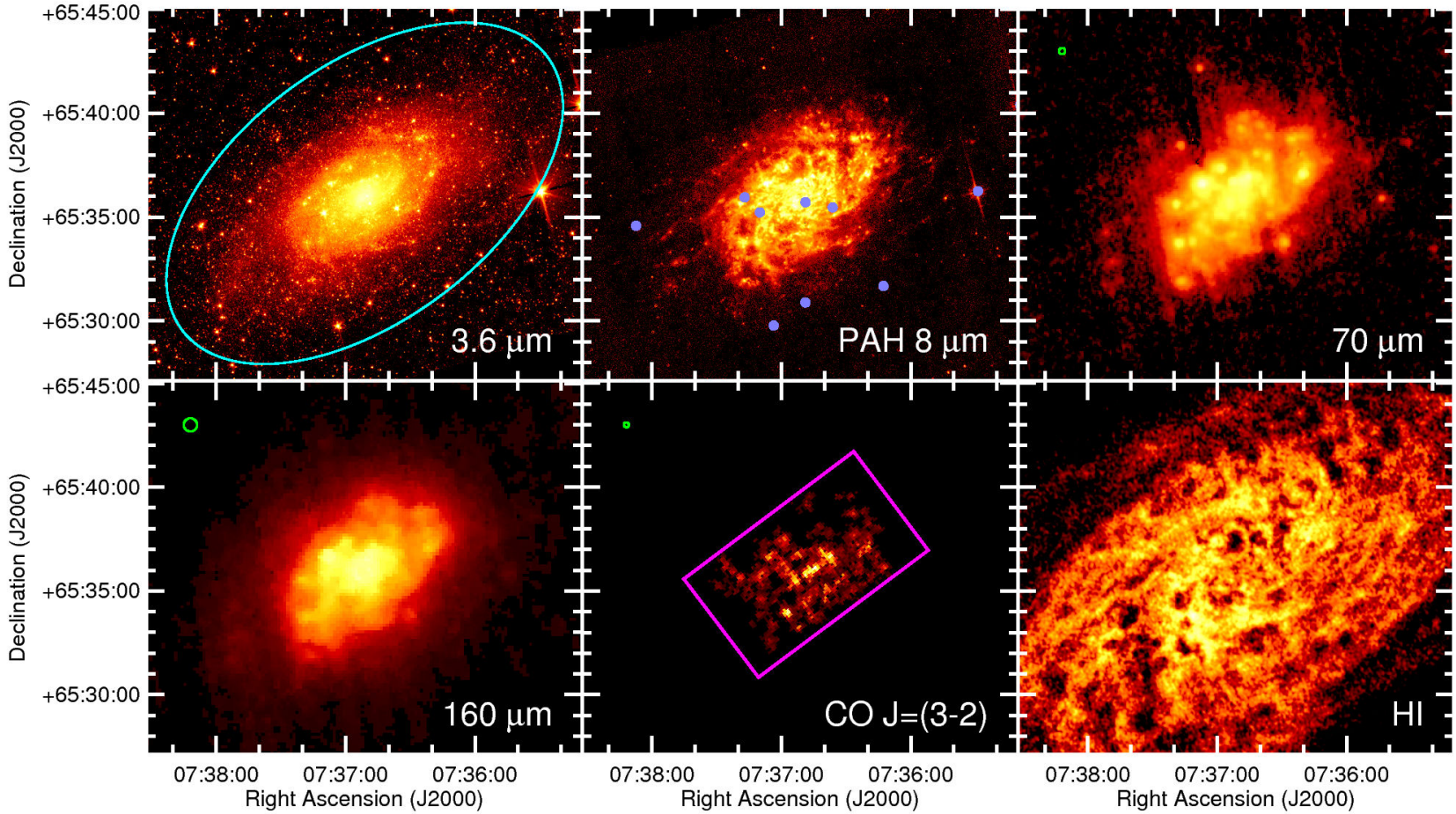
Quick Overview of Data in JCMT Nearby Galaxies Legacy Survey

- Sample created using HI flux and distance as selection criteria.
- Sample includes:
  - 47 galaxies from SINGS
  - 72 additional randomly-selected field galaxies
  - 36 additional randomly-selected Virgo Cluster galaxies
- When complete, survey will have the following data:
  - CO J=(3-2) image cubes from HARP-B (already taken)
  - 450, 850 μm images from SCUBA-2 (observations begun)

Goals in NGC 2403 Analysis
(test case for study with whole sample)

- Study whether/how gas-to-dust ratios vary.

- Further study relation between PAH and CO emission identified by Regan et al. (2006, ApJ, 652, 1112).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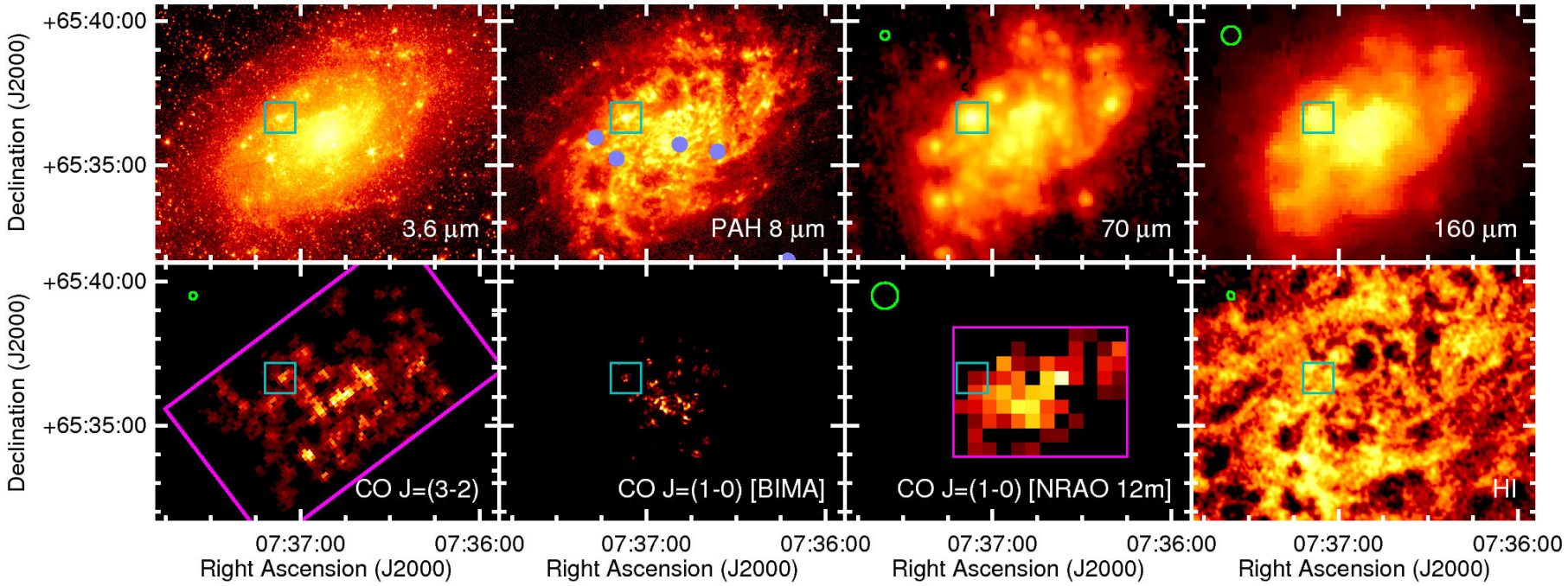
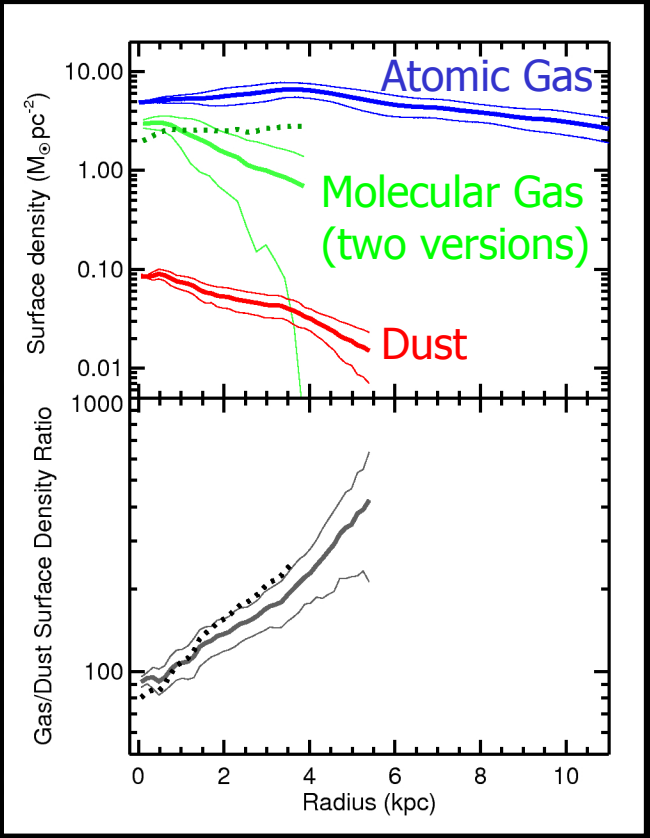
Declination (J2000)
3.6 μm
PAH 8 μm
70 μm
160 μm
CO J=(3-2)
HI
07:38:00
07:37:00
07:36:00
Right Ascension (J2000)

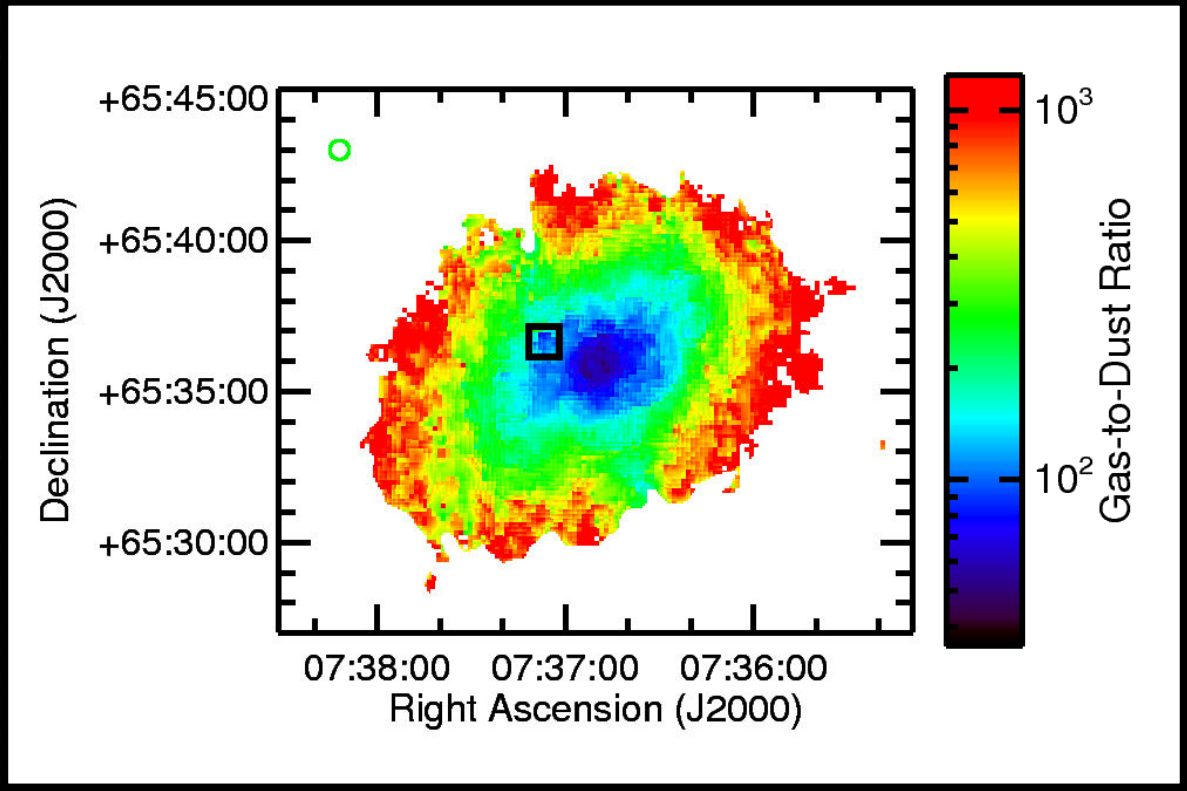

+65:40:00
+65:35:00
Declination (J2000)
3.6 μm
PAH 8 μm
70 μm
160 μm
CO J=(3-2)
CO J=(1-0) [BIMA]
CO J=(1-0) [NRAO 12m]
HI
07:37:00
07:36:00
Right Ascension (J2000)

Radial Profiles of Gas and Dust Surface Density



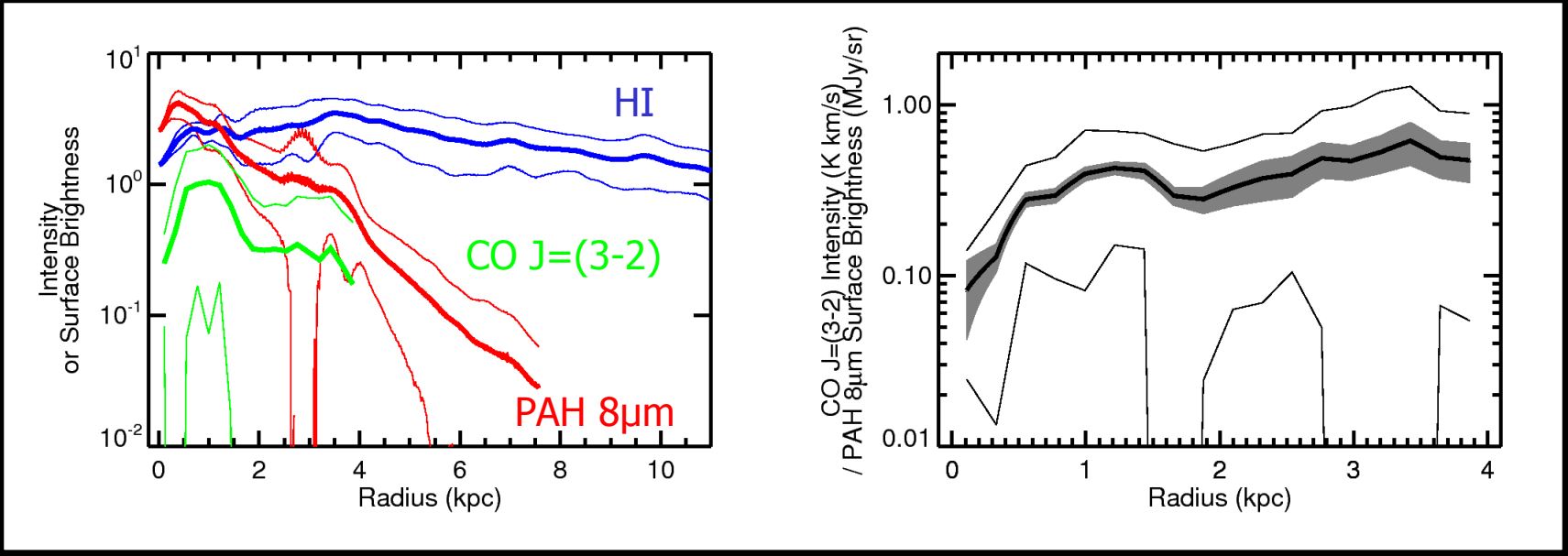
- Gas-to-dust ratio increases monotonically with radius.
- Slope of gas-to-dust ratio is close to slope of 12+log(O/H), implying gas-to-dust ratio is strongly linked to metallicity.

Gas-to-Dust Ratio Map



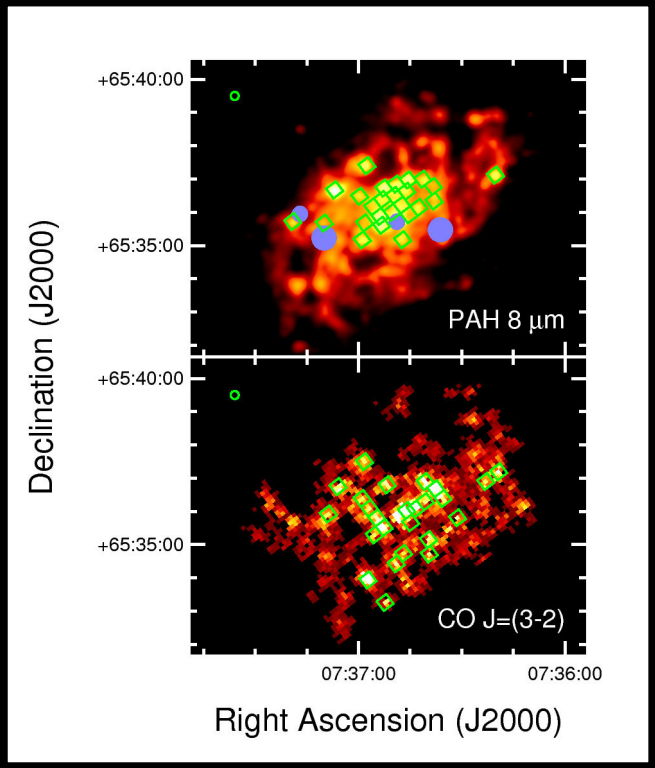
- Gas-to-dust ratio depends primarily on radius.
- Additional evidence suggesting that ratio is strongly linked to metallicity.

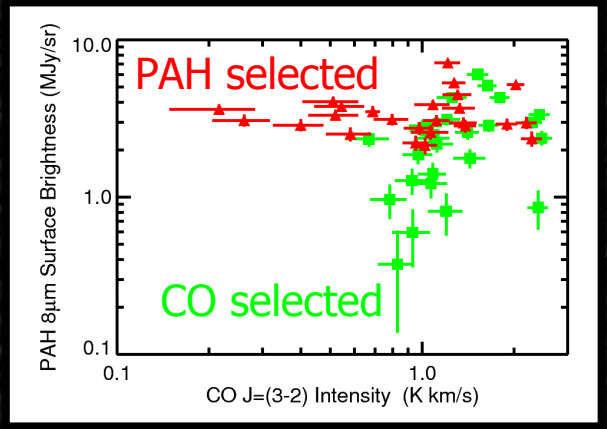
PAH/CO Comparison



- PAH 8 μm and CO *J*=(3-2) emission both have similar radial profiles, but dispersion is very high.

PAH/CO Comparison





- Correlation between PAH 8 µm and CO J=(3-2) emission on sub-kpc scales is poor.
- Two emission sources could be linked through stellar potential wells or star formation, but mechanisms that link emission are complicated and indirect.

Conclusions

- Gas-to-dust ratio varies primarily with radius. Results imply that radius is linked to metallicity.
- Radial profiles of PAH 8μm emission and CO *J*=(3-2) emission appear similar, but the wave bands are not correlated on sub-kpc scales.
- Future work with more galaxies in survey will show whether these results hold for a broader range of galaxies.

See Bendo et al., 2009, astro.ph/0911.3369 for more details.