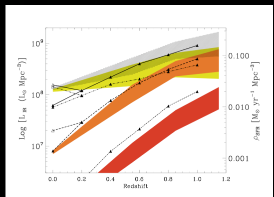
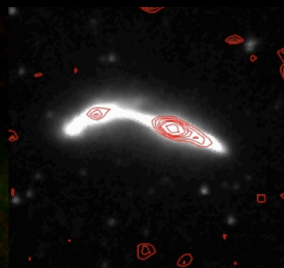
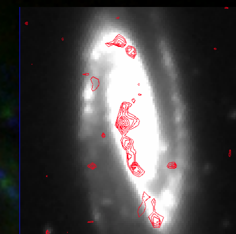
Poster 15: Mid-Infrared through Millimeter View of LOCAL LUMINOUS INFRARED GALAXIES

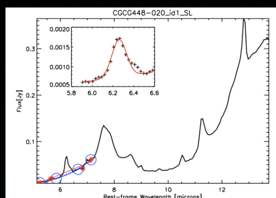




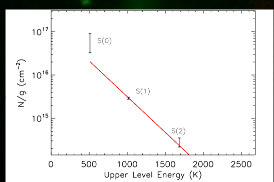
Andreea Petric (Caltech)

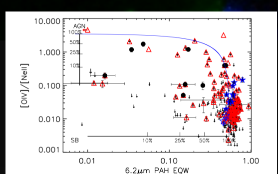
& the GOALS collaboration



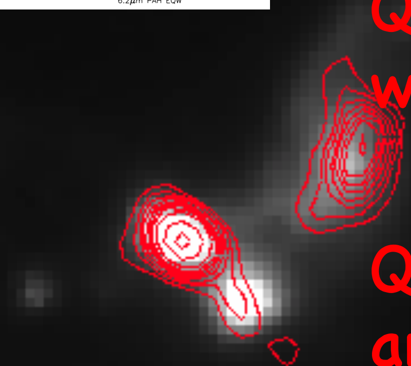


Question 1: Where does the IR come from, e.g. AGN/SB contribution to the IR luminosity from MID-IR spectroscopy

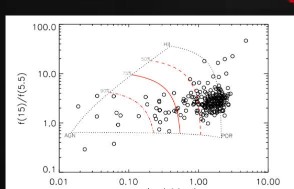


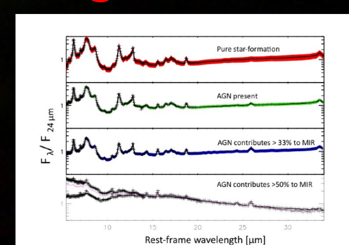


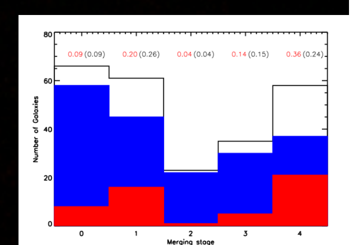
Question 2. What are the properties of the warm and cold molecular gas in LIRGs?



Question 3. How do mergers shape the answers to 2 and 1?







Conclusions I

- 10% of local LIRGs are AGN dominated and 12% of the total bolometric Luminosity in local LIRGs comes from AGN

- LIRGS are between normal galaxies of which 5% are AGN dominated (e.g. Goulding et al. 2009) and ULIRGs of which 30-40% are AGN dominated (e.g. Armus et al. 2007, Veilleux et al. 2009)

- LIRGs with low 6.2 μm PAH EQW (<0.27 μm) detections are a different population than that of LIRGs with high (>0.27 μm EQW)
  -later merger stage
  -higher median total 24 μm luminosity
  -warmer (f5/f24 nuclear) and (f24/f70) colors
  -however no tight correlations

- The average spectrum of sources with an AGN looks similar to the average spectrum of sources without an AGN, but it has lower PAH emission and a flatter MIR continuum.

Conclusions II

- Warm H_2 detected in at least one transition in 40% of sources and S0 28.2μm detected in significantly more LIRGs than ULIRGs

- H_2 scales with aromatic band emission as seen in normal galaxies

- Wider range in total H_2 to IR ratios than in ULIRGs but similar to normal galaxies (eg. Higdon et al. 2006, Roussel et al. 2007)

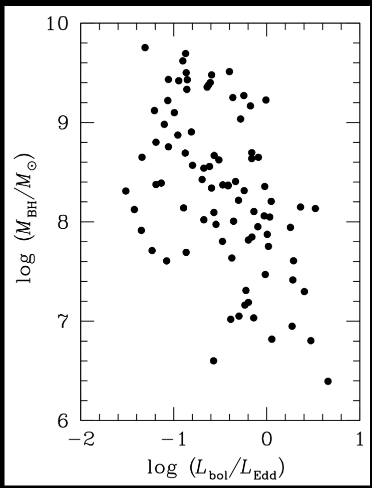
- median M=3 x 10^9 M$\odot$ H2 (using a *Galactic Conversion factor*)

- Warm *gas* (~100K) ~1-0.01%

- Molecular *gas* surfaces ~200 M$\odot$/pc^2

Poster 16

The Herschel View of the Palomar-Green QSOs: Measuring the ISM Content of a Large Volume Limited Sample of Nearby Quasars



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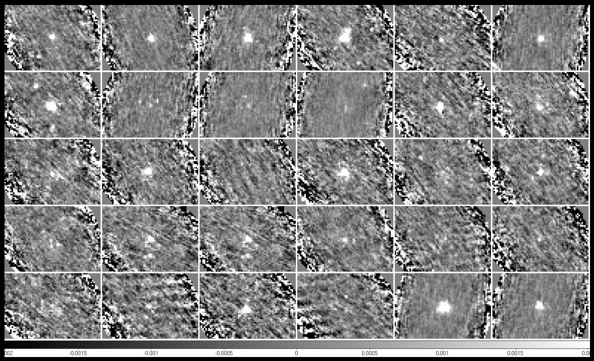
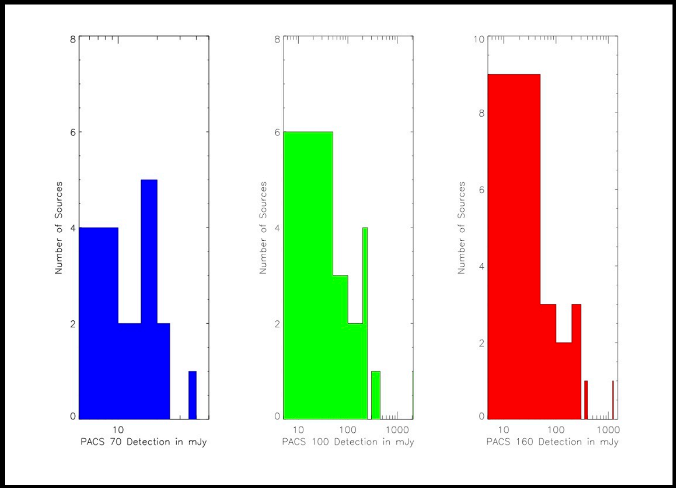
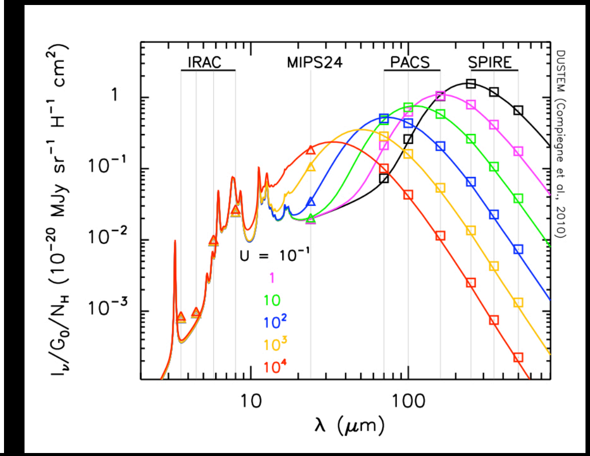
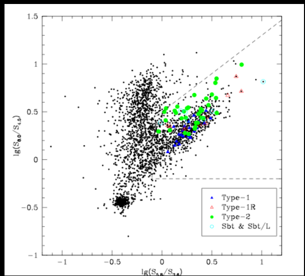






sensitivities should yield measurements down to $3\times10^7 M_\odot$ of ISM.

Poster 47



Broadband properties of MIR selected AGNs at $1 < z < 4.5$

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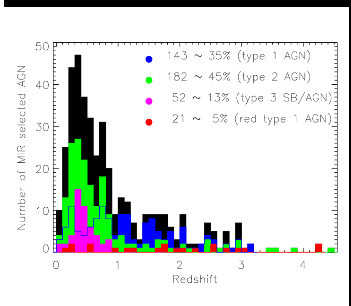
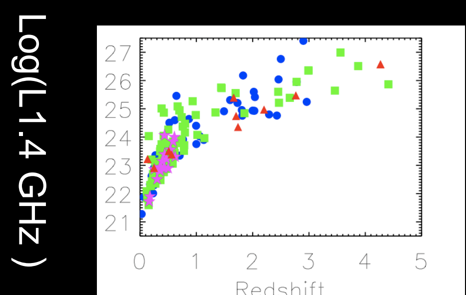
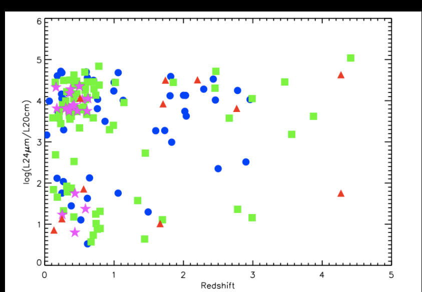
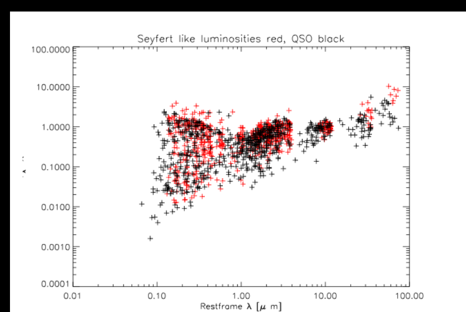
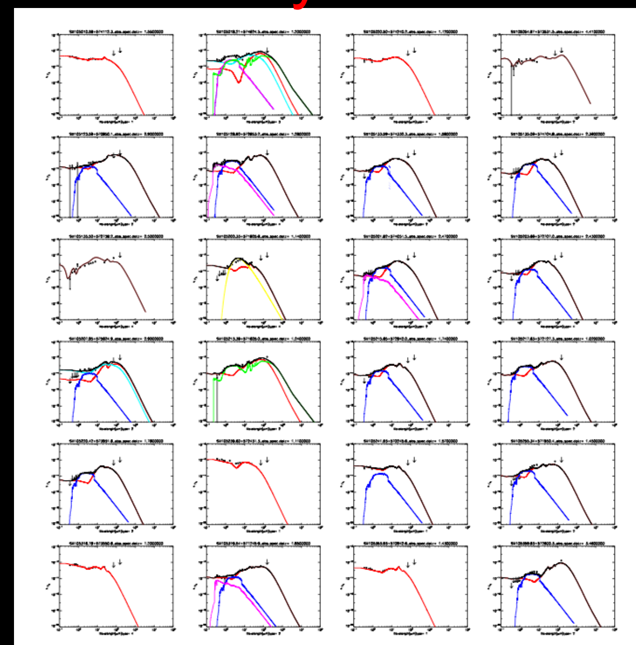


What are the differences between the SED of narrow and broad-line MIR selected AGN as a function of redshift and luminosity?

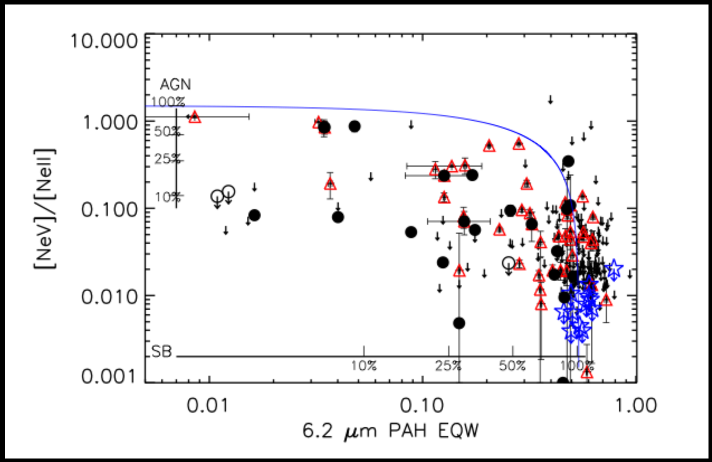


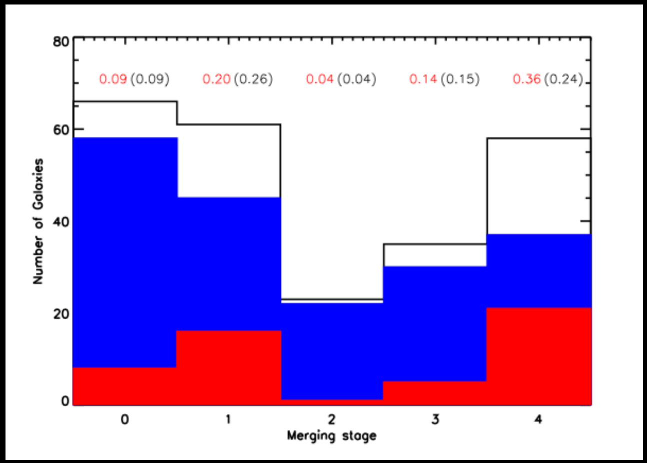


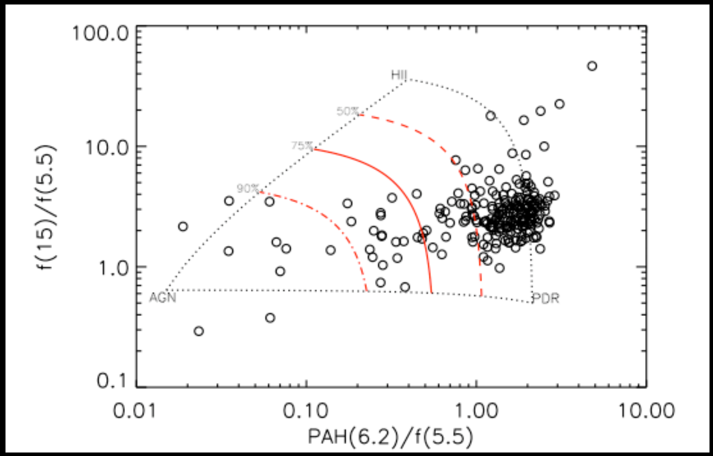


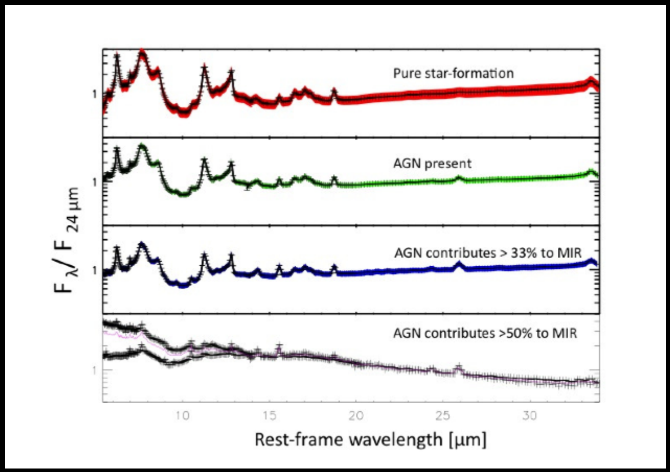


AGN contribution to the IR Luminosity









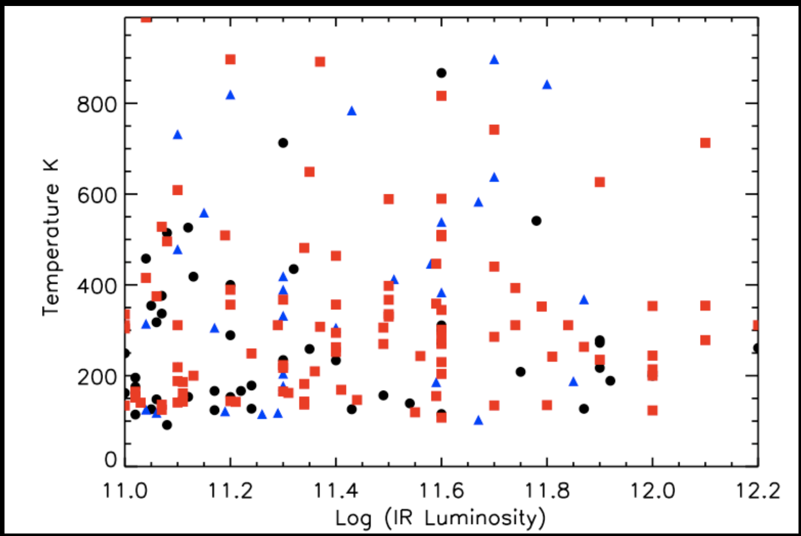
Petric et al. 2011, ApJ 730, 28

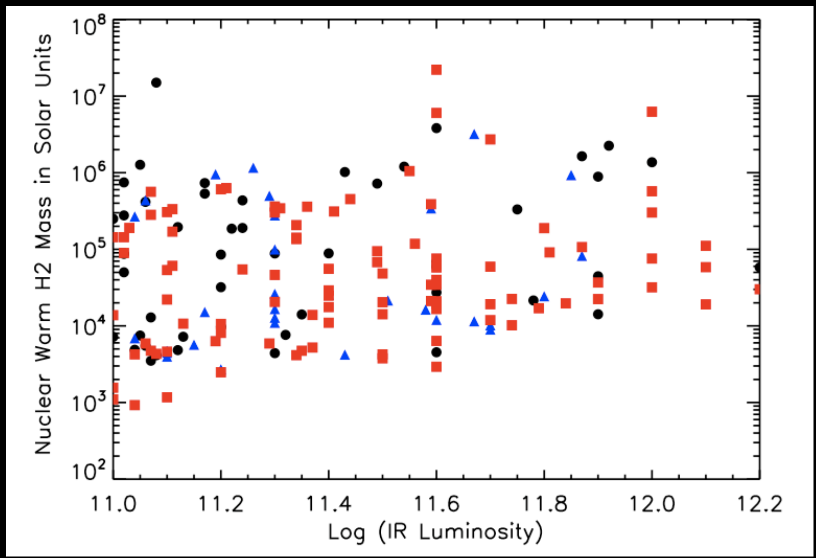
In local LIRGs star formation is the main energy supplier to the bolometric luminosity

Diagnostic	% of sources with AGN contributions to the bolometric luminosity more than 50%	Total AGN/ Total bolometric luminosity for the sample
[NeV]/[NeII]	9%	10%
[OIV]/[NeII]	10%	12%
6.2 μm PAH /5.5 μm continuum	11%	13%

Petric et al. 2011, ApJ 730, 28

Nuclear Warm H_2 temperatures and Masses



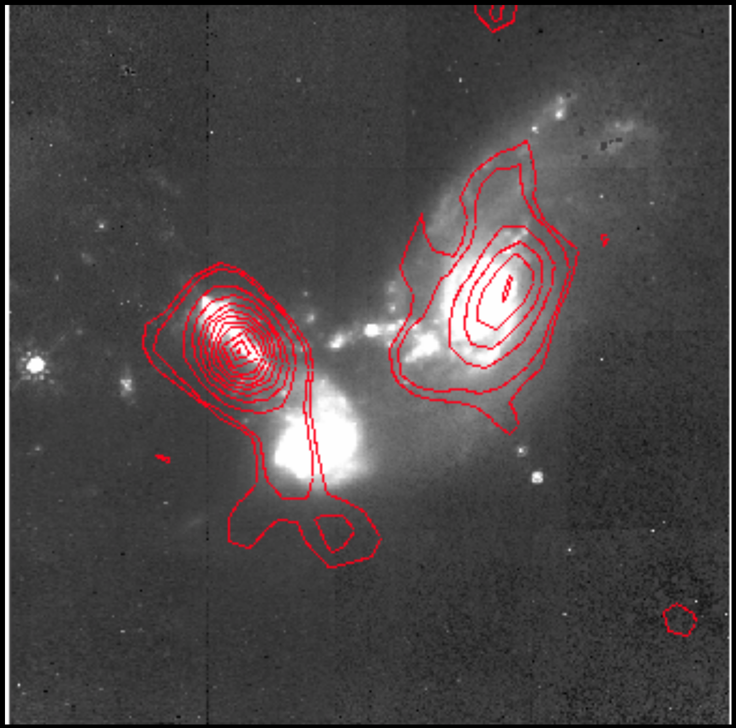


black –isolated galaxy early stage merging late merging

- No obvious correlation between merger stage and excitation temperature
- Weak correlation between the mass and IR luminosity

20 LIRGS with CARMA
~50 M⊙ pc^{-2} 20-80 km/sec
Sensitivty M_{H2}~10^{8-9} M⊙

Example: II Zw 96



- Peak surface density 1000 M⊙/pc^2
- 6 x 10^9M⊙ CO(1–0)
- SFR 120 M⊙/yr
- 10^7 years to finish the gas reservoir at these rates