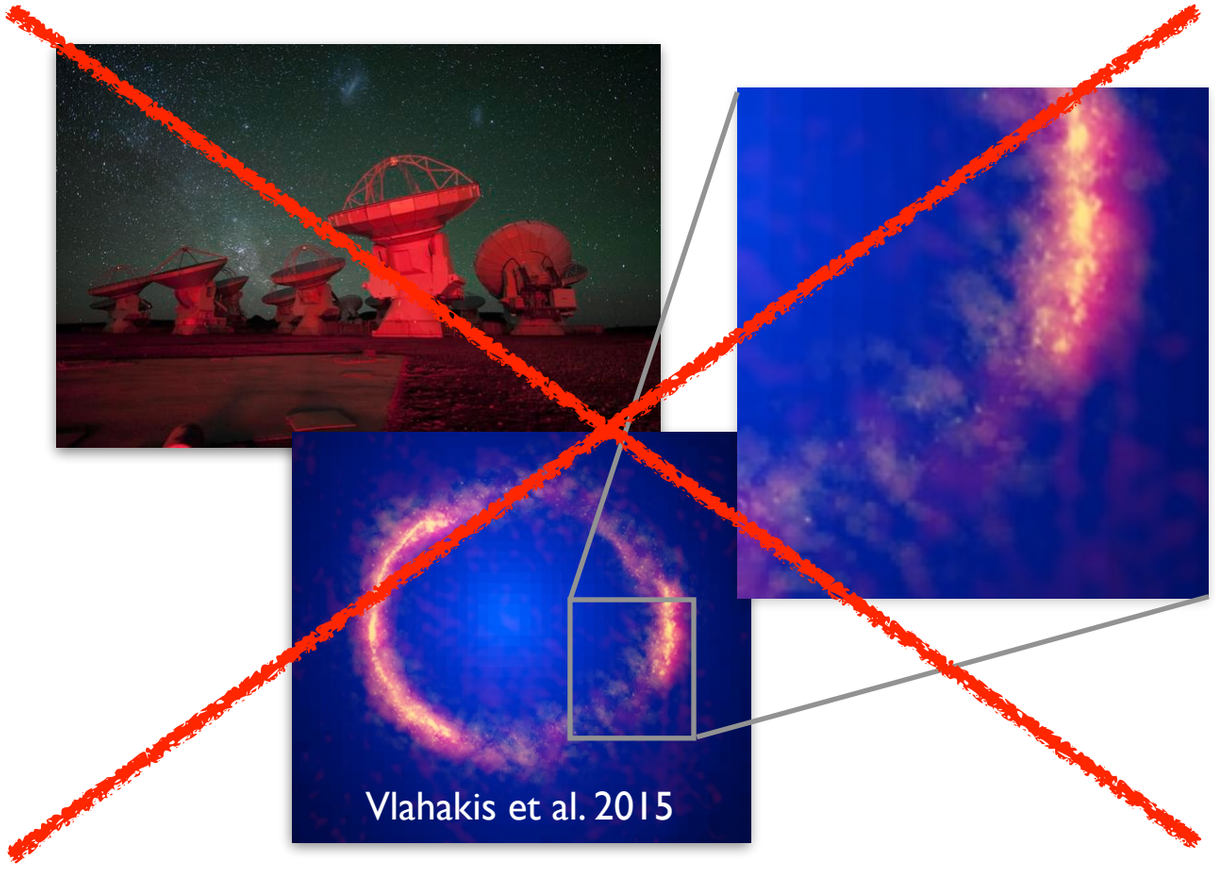
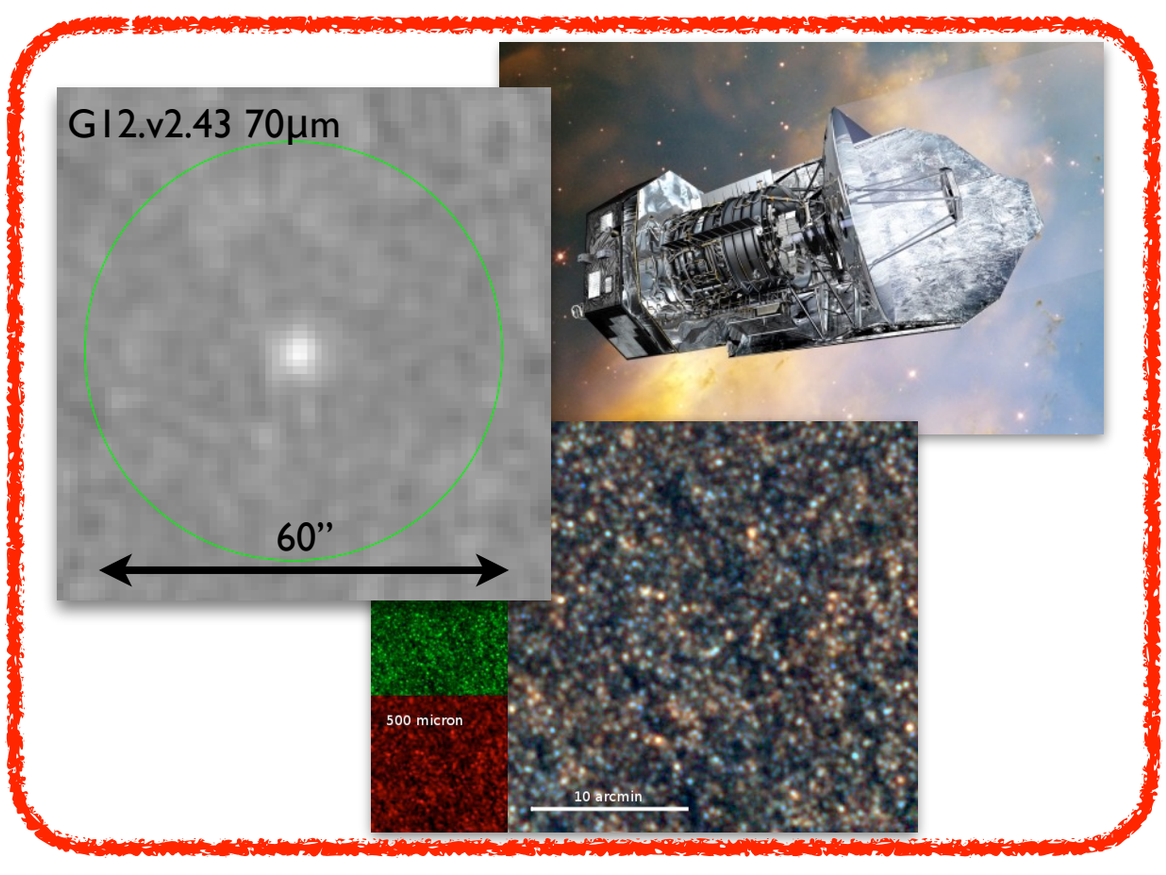
The ISM in high-*z* SMGs probed by mid-IR spectroscopy

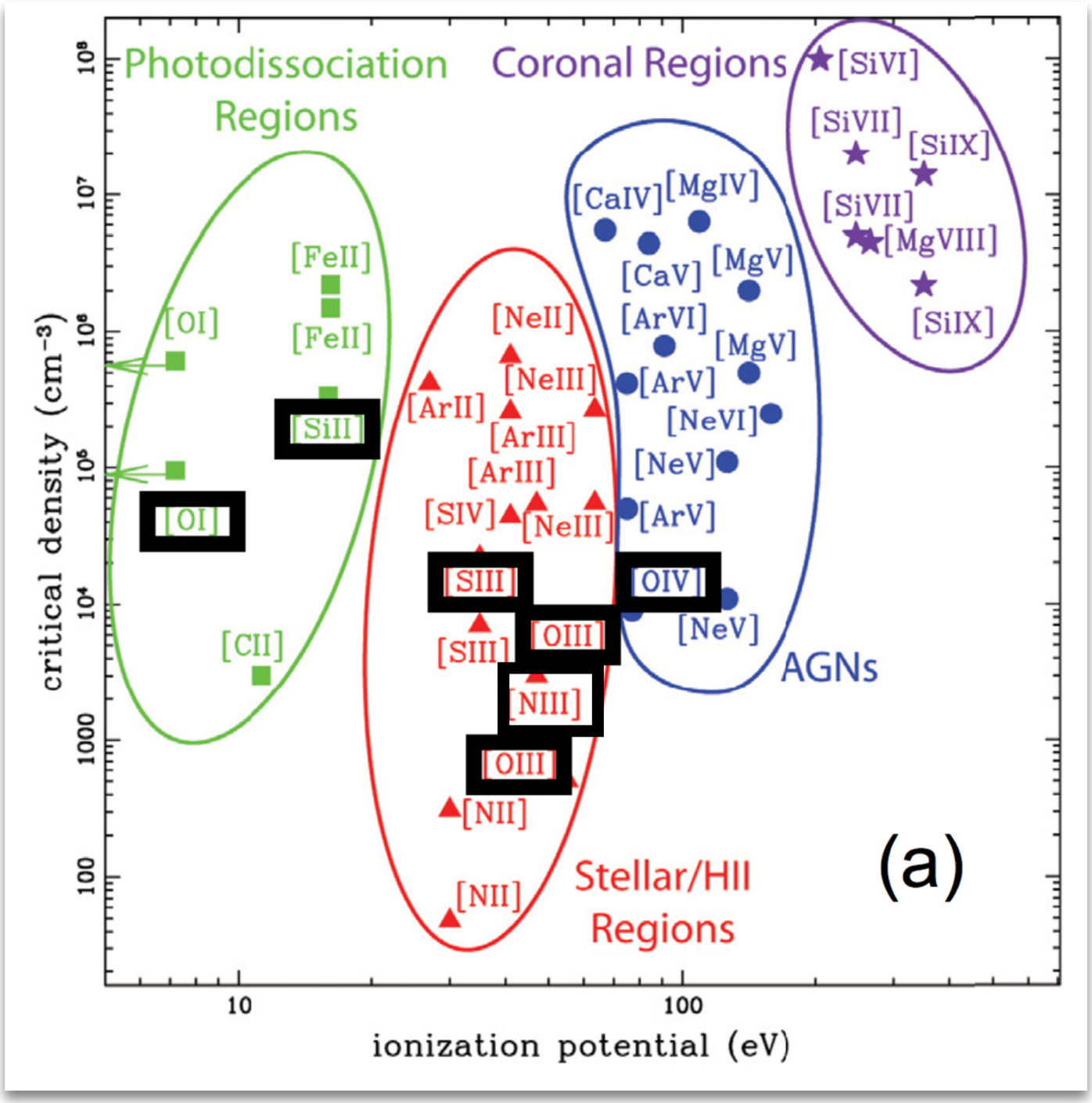
Julie Wardlow
Centre for Extragalactic Astronomy





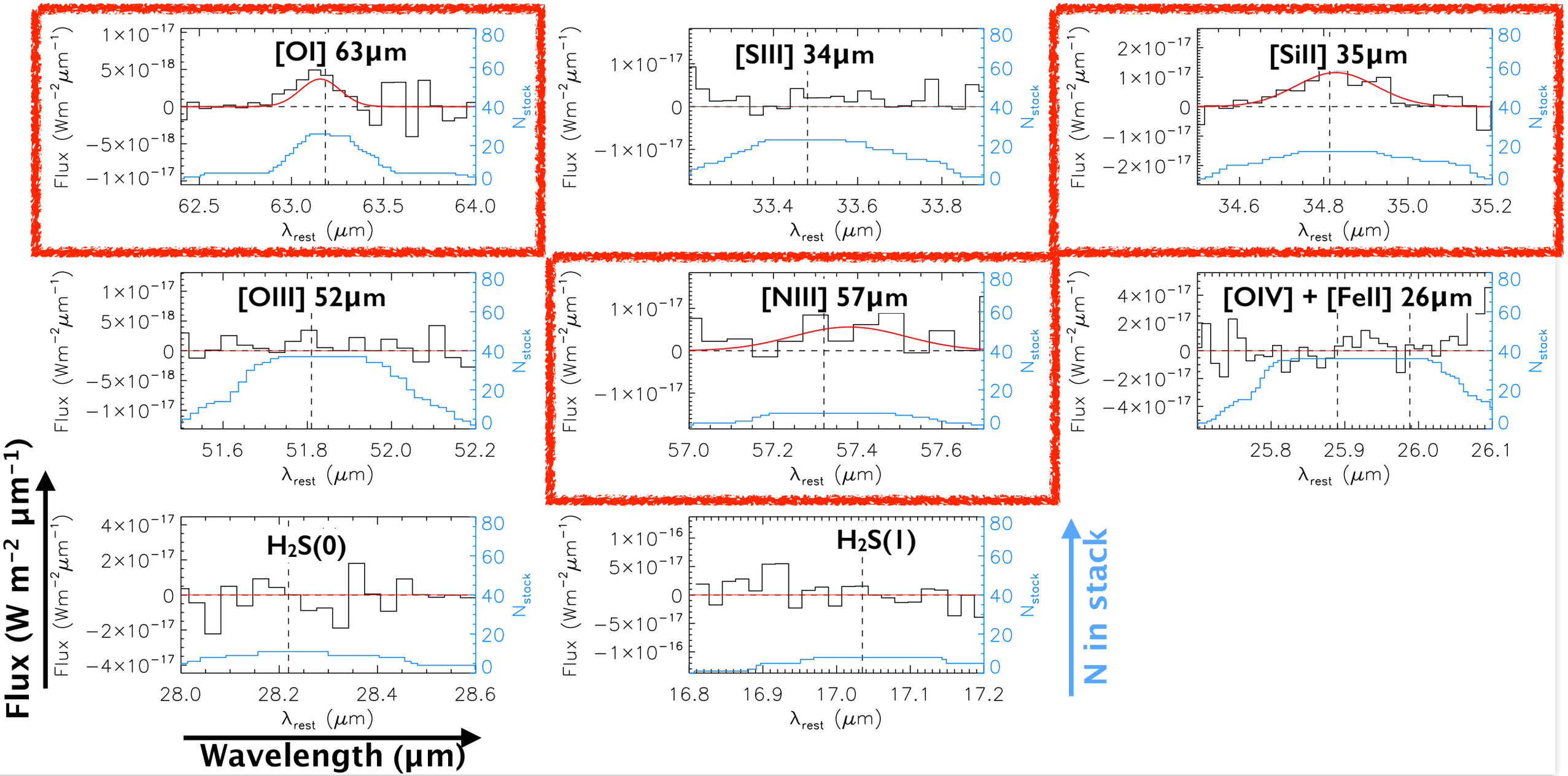
“The Advantages of Resolution” —> “Progress even at low resolution (+ some limitations)”

Herschel PACS spec survey: 13 targets + 32 archival; lines trace PDRs, HII regions & AGN excitation



Spinoglio et al. 2009

Stacking gets deep enough for some detections

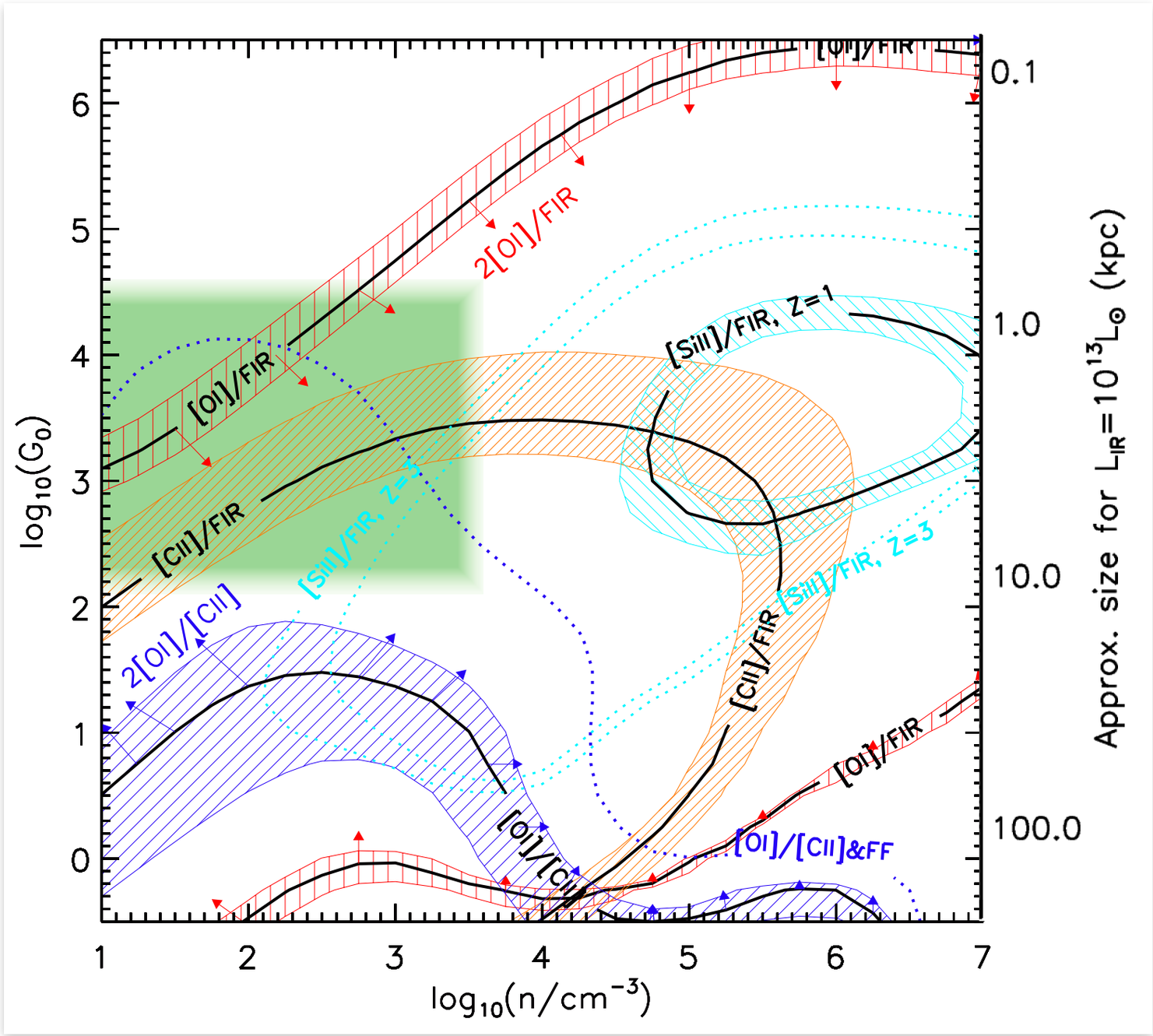


Wardlow et al. ApJ in press

We use the [OI], [SiII] & (published) [CII] to constrain PDR (gas) parameters via modelling

Additional considerations

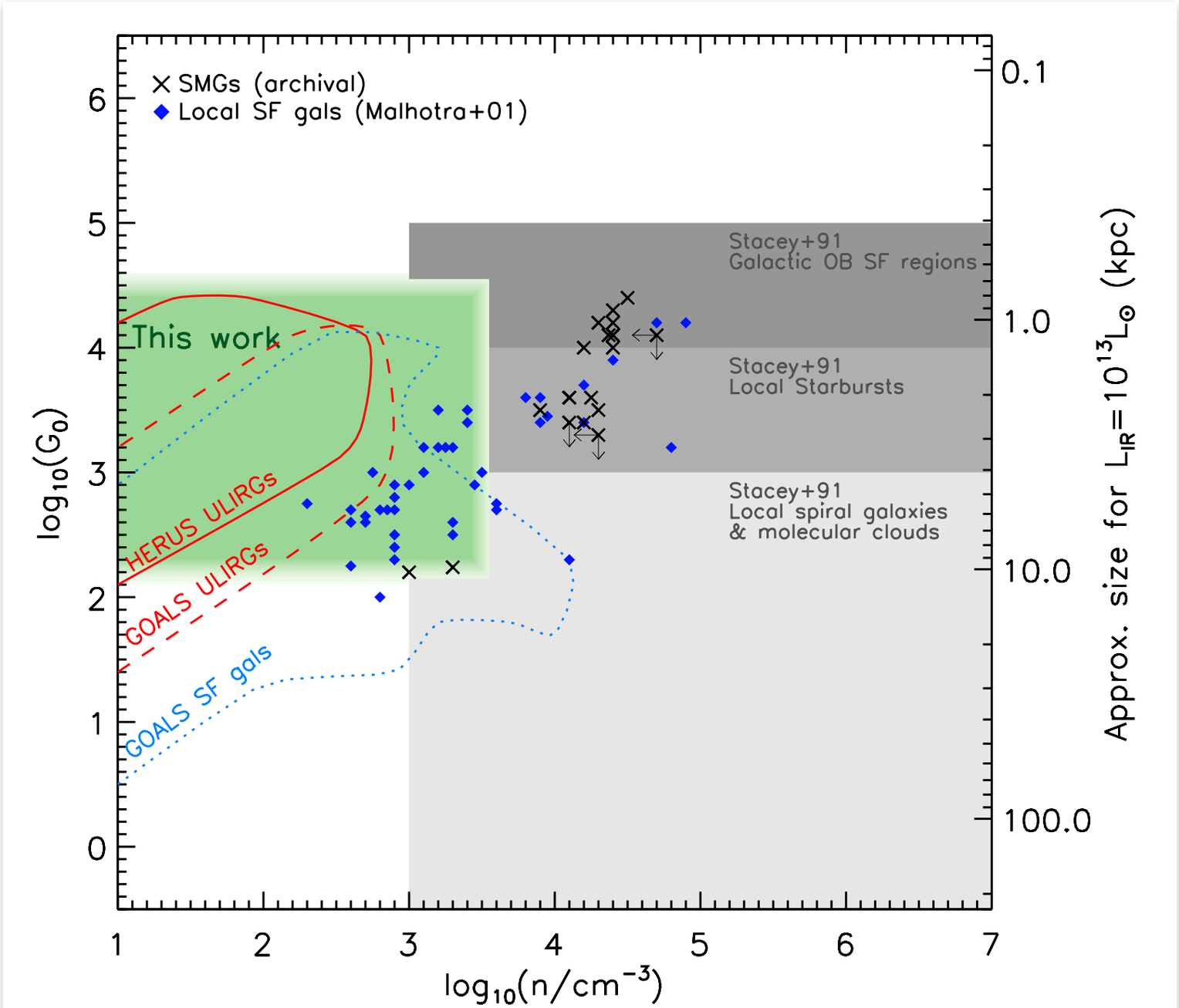
- [OI] self absorption
- Metallicity & AGN contribution
- HII region contribution
- Filling factors: M82 values from Kaufman et al. (1999) to estimate strength
- Optical thickness
- Differential lensing: use Serjeant (2012) to estimate effects.
- Source sizes



Using PDR Toolbox (Kaufman et al. 1999, 2006 models).
[CII] from Gullberg et al. 2015

Wardlow et al. ApJ in press

PDR modelling indicates gas conditions



Using PDR Toolbox (Kaufman et al. 1999, 2006 models)

Wardlow et al. ApJ in press

Summary

Also talk to me about:
* Metallicity & AGN results from these data.
* Lensed SMG surveys from Herschel.
* z>4 SMG surveys from Herschel.

Mid-IR spectroscopy can be used to probe the ISM in dusty high-z galaxies.

There's no current facilities capable of taking more of these data at high-z. Plans are afoot, but resolution will still be an issue.

Stacked mid-IR spectroscopy indicates SMGs have average $n \sim 10^{1-3}$cm^{-3} and $G_0 \sim 10^{1.5-3.5}$.