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

We use the [OI], [SII] & (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
PDR modelling indicates gas conditions

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

Summary

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

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

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.

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