Multi-wavelength properties of SMGs

Ugnė Dudzevičiūtė Durham University

Supervisors: Dr Mark Swinbank, Prof Ian Smail AS2UDS: Bitten Gullberg, Stuart Stach & Collaborators

SMGs: what are they?

- Population of galaxies with large sub-mm flux (>1mJy)
 - Faint or completely undetected in optical
 - Dusty
 - High redshift
 - \circ ~ Very luminous systems (LFIR > 10^{12} \, L_{\odot}) with inferred SFRs of >100 $M_{\odot} yr^{-1}$

• Believed to be progenitors of today's most massive galaxies



AS2UDS

• Based on a complete sample of 716 850-µm sources selected from the S2CLS map of the UDS field.

- Follow up with ALMA (Cycle 1/3/4) identified **708** SMG galaxies:
 - Largest sample of ALMA-detected SMGs currently available
 - Provides the statistical sample necessary to study the SMG population in detail.

- Multi-wavelength data available:
 - <u>Optical</u>: U, B, V, R, I, z, Y, J, H, K, CH1, CH2, CH3, CH4,
 - <u>Infrared</u>: MIPS 24μm, PACS 100μm/160μm, SPIRE 250μm/350μm/500μm, ALMA 870μm, Radio 1.4GHz



Simpson et al. 2015

Typical SMG SED



Typical SMG SED



Typical SMG SED



MAGPHYS Overview

Relies on energy balance technique to consistently model full SED from UV to radio



- 25,000 optical models (Bruzual & Charlot 2003)
- IMF: Chabrier 2003
- 50 random redshifts according to the prior.

- Wide range of temperatures and fractional contributions total infrared luminosity
- 25 random redshifts according to the prior

- Combines the libraries to produce full SEDs
- Compares to observed data (χ² analysis)
- Returns:
 - Best fit model
 - Best fit parameters
 - PDFs of parameters

AS2UDS Redshift distribution

- Comparison to spectroscopic redshifts showed good agreement for both, DR11 and AS2UDS samples:
 - Outliers expected due to variety of populations, confusion between breaks and uncertainties in photometry

- Field sample allowed to test:
 - IGM effect
 - Radio-FIR relation
 - Flat prior



AS2UDS Redshift distribution



AS2UDS Redshift distribution

A trend between 870µm flux and redshift is observed with a gradient of:

 $0.09 \pm 0.01 \, mJy^{-1}$

 $(0.8 \pm 0.2 \text{ mJy}^{-1} \text{ for } S_{870} > 4 \text{mJy})$

Results suggest that brighter SMGs lie at higher redshift



AS2UDS Composite



AS2UDS Luminosity



Summary

• AS2UDS: 708 ALMA-identified SMGs from a 1deg. SCUBA-2 survey

• Redshift estimation:

A trend between 870µm flux and redshift is observed ______ brighter SMGs are found at higher redshift

• Future:

KMOS LP approved ______ spectroscopic redshifts will allow to break some degeneracies from photometric estimations