A view of the Obscured Star Formation at redshifts 0.6 - 1.2

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Background

Dust present in star forming regions absorbs a large fraction of the ultra-violet (UV) radiation from stars.
So, estimates of stellar activity (e.g. star formation rate) do not provide a complete picture.
The absorbed UV light is emitted as thermal radiation in the far infrared (FIR) part of the electromagnetic spectrum. But, it is not easy to resolve all the sources with the FIR instruments.
A workaround is **Stacking** : wherein the sources are resolved at smaller wavelengths (e.g. at UV or Hα), and the positions of these resolved sources are used as prior positions where FIR fluxes can be extracted from the low resolution maps.
By averaging the flux densities, ensemble properties of a population can be constrained.

Data/Sample

We use UV source-lists from XMM-OM imaging in the CDFS and COSMOS fields. These sources are stacked on the FIR maps created using data from PACS and SPIRE instruments onboard Herschel space observatory.
We bin our sources according to their UV luminosity and calculate their average FIR properties as a function of redshift and UV luminosity.

FIR Spectral fitting

We fit spectral templates from [1] and modified black body curves to the average flux densities in each UV bin (Fig. 1.)

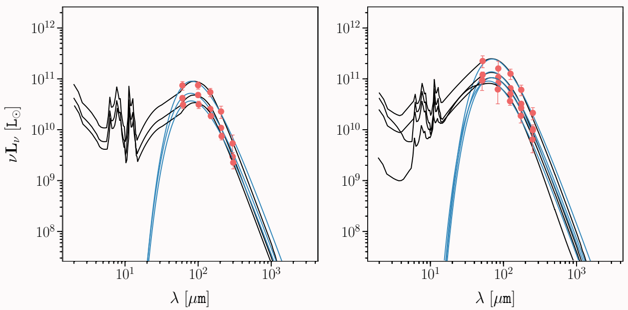
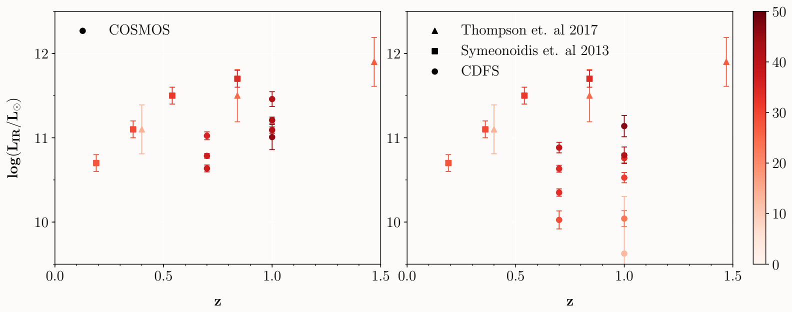


Fig. 1. *IR spectral template fits (black) to the stacked flux densities (orange) for the COSMOS field. Each template represents a UV bin. The blue curves represent the grey body fits.*

Fig. 2. *Total FIR luminosity as a function of redshift. The colour-bar represents the dust temperature.*



FIR properties

From spectral and grey-body fits we calculate the total IR luminosity and dust temperatures of galaxies averaged in a UV bin. These are plotted in Fig. 2.

Dust attenuation

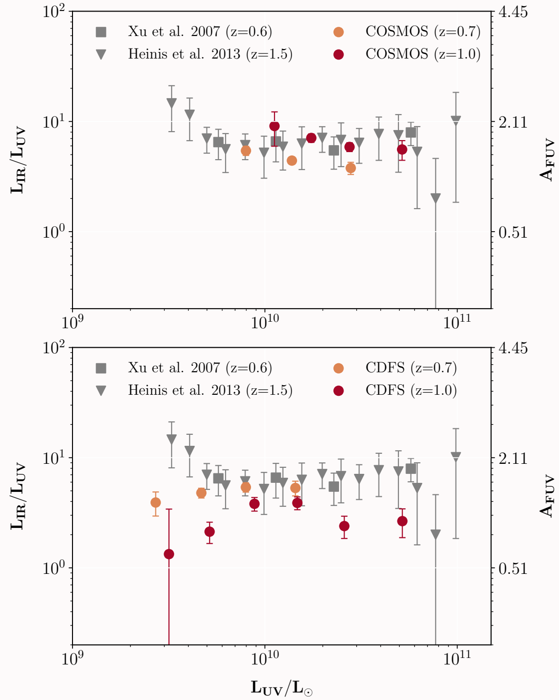
$$A_{FUV} = 2.5 \log \left[\frac{1}{1.68} \left(\frac{L_{IR}}{L_{FUV}} \right) + 1 \right] \qquad (1)$$

Dust attenuation is calculated using the ratio of IR to UV luminosity in eq 1. Our results for the COSMOS field are consistent with previous studies (Fig. 3). Whereas, we have slightly lower value at z ~ 1 in CDFS.

Up next ...

. Calculating the IR LF with some assumptions and estimating the obscured SFR density in this redshift range.
. Extending this work to more fields with XMM-OM and Herschel observation to tackle the cosmic variance.
. Extending the work to lower redshifts.

Fig. 3. *The infra-red to UV luminosity ratio as a function of as a function of UV luminosity. The right side y - axis shows the dust attenuation calculated using eq. 1 for both CDFS (lower panel) and COSMOS (upper panel) fields. Two previous studies are plotted in grey for comparison.*



References

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