

Distant, dusty star-forming galaxies

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Abstract

This daily updated notes for the PhD research project on distant, dusty star-forming galaxies.

Keywords

SMG — Starburst — galaxy evolution

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1. Introduction

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2. Number counts and luminosity function

There is a debate on the abundance of the faint population of SMGs.

However, as indicating from other high- z galaxy populations, [Bacon et al. \(2021\)](#) based on the extreme deeply MUSE observation from one pointing in HUDF, they argued that the bulk of extended Lyman- α emissions come from abundant population of ultra-faint undetected LAEs.

3. Gas inflow and outflow

3.1 Gas inflow

It is more difficult to identify gas inflow than outflow. Comparing outflow, inflow gas is thought to be metal poor. From standard Λ CDM model, pristine gas from cosmic web can feed the star formation of the host. It can be essential for SMGs to maintain their extreme SFR. If such kind of bulk inflow do exist in SMGs, which can also be test by their absorption characteristics. The first detect such a strong evidence of metal-poor gas inflow by search SMGs in the surrounding of background QSOs ([Fu et al. 2021](#)). The system thet found is quite interesting, which a bulk of absorption lines were detected from two QSOs. The two quasars have different distance to the SMG, but they show some consistancy in term of some metal absorption lines.

Besides, several indirect methods also suggest the existing of metal-poor gas inflow in SMGs. For example, found the stacked gas phase metalicity of galaxies in one proto-cluster is slightly smaller than the field galaxies.

3.2 Gas outflow

4. The fate of SMGs

4.1 Dark matter halo

4.2 AGN

It is very hard to quantify the AGNs' contribution on the IR emission, even though a dominant contribution was suggest for the most luminous ULIRGs ([Symeonidis & Page 2021](#)). [Iverson et al. \(2019\)](#) had demonstrated the conundrum may appear bettween SED fitting and X-ray luminosity. :q

4.3 Size evolution

Dust emission in SMG were found to be very compact.

However, comparing with other high- z galaxy populations, ubiquitous extended Ly α were found around the CGM of individual galaxies at $z > 3$ (See [Wisotzki et al. 2016](#); [Leclercq et al. 2017, 2020.](#))

5. Proto-clusters

Proto-clusters have been discovered in different wavelength.

In submillimeter bands, previous hyper-luminous sources found by signle-dish telescope were found to host multiple members ([Oteo et al. 2018](#); [Miller et al. 2018](#)). Since then, there are several projects aiming to find more similar system.

Acknowledgments

So long and thanks for all the fish [Oteo et al. \(2018\)](#) and [Miller et al. \(2018\)](#).

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