

Infrared spectral energy distributions of submillimetre galaxies

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Abstract

Submillimetre (submm) galaxies have very high infrared (IR) luminosities and are orders of magnitudes more numerous at $z \sim 2$ than local ultra-luminous IR galaxies. They therefore represent a key phase in galaxy evolution which can be missed in optical surveys. Determining their contribution to the global star formation rate requires dissecting their IR emission into contributions from starbursts (SB) and active galactic nuclei (AGN). There are several examples of AGN systems which masquerade as SBs in either the IR or X-ray, and SBs can often look like AGN in some wavebands. A combination of SB and AGN emission is not unreasonable, given models of merger-driven evolution. To assess in details what powers the intense IR luminosity of submm galaxies it is important to obtain a complete multi-wavelength picture. Mid-IR spectroscopy is a particularly good probe of where the intense IR luminosity is coming from. We present the first results from a program to obtain IRS spectroscopy of a sample of high redshift galaxies in GOODS-N, a large fraction of which are submm galaxies. This field is already home to the deepest X-ray, optical, IR and radio data. We piece together submm data with the Spitzer photometry and IRS spectra to provide a well sampled IR SED of submm galaxies. We compare the IRS spectra from the submm galaxies with those from other high redshift galaxies and, by comparing the features and line-continuum ratios, we can separate the AGN and SB components in the mid-IR. Combined with the submm and X-ray data, we are able to quantify the contribution to the bolometric luminosity from the AGN and SB components.