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Active Galactic Nuclei in Dusty Starbursts at z = 2: Feedback Still to Kick in (Giulia Rodighiero)

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We investigate a sample of 152 dusty sources at 1.5 < z < 2.5 to understand the connection of enhanced star formation rate (SFR) and black hole accretion rate. The sources are Herschel-selected, having stellar masses M * > 1010 M ⊙ and SFR (~100–1000 M ⊙ yr−1) elevated (>4×) above the star-forming "main sequence," classifying them as starbursts (SBs). Through a multiwavelength fitting approach (including a dusty torus component), we divided the sample into active SBs (dominated by an active galactic nucleus (AGN) emission, SBs-AGN, ~23% of the sample) and purely star-forming SBs (SBs-SFR). We visually inspected their Hubble Space Telescope/ultraviolet (UV) rest frame maps: SBs-SFR are generally irregular and composite systems; ~50% of SBs-AGN are instead dominated by regular compact morphologies. We then found archival Atacama Large Millimeter/submillimeter Array continuum counterparts for 33 galaxies (12 SBs-AGN and 21 SBs-SFR). For these sources we computed dust masses, and, with standard assumptions, we also guessed total molecular gas masses. SBs turn into gas-rich systems (f gas = M gas/(M gas + M *) ≈ 20%–70%), and the gas fractions of the two SB classes are very similar (f gas = 43% ± 4% and f gas = 42% ± 2%). Our results show that SBs are consistent with a mixture of: (1) highly star-forming merging systems (dominating the SBs-SFR) and (2) primordial galaxies, rapidly growing their M * together with their black hole (mainly the more compact SBs-AGN). Feedback effects have not yet reduced their f gas. Indeed, SBs at z = 2, with relatively low bolometric AGN luminosities in the range 1044 < L bol(AGN) < 1046 erg s−1(compared to bright optical and X-ray quasars), are still relatively far from the epoch when the AGN feedback will quench the SFR in the host and will substantially depress the gas fractions.