AGN feedback and outflows : the road to star formation quenching

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Abstract

The unique synergy of spectroscopy from large surveys (VUDS, zCOSMOS, public surveys in the GOODS-S), complemented with public HST imaging, Chandra X-ray data, and Spitzer and HERSCHEL infra-red data is exploited to investigate the relationships between galaxies and AGNs at $z \geq 1$.

First exploratory results based on a small sample of galaxies at $1 < z < 3$ with ultradeep spectroscopy from the GMASS survey (Cimatti et al. 2013) showed possible evidence of the feedback processes triggered by AGNs, that are thought to lead to the rapid suppression of the star formation activity in high redshift galaxies. In the colour-mass plane, two parallel trends emerge during the ∼2 Gyr between the average redshifts z∼2.2 and z∼1.3: while the red sequence becomes rapidly more populated by ellipticals, the majority of AGNs disappear from the blue cloud/green valley where they were hosted predominantly by star-forming systems with disk and irregular morphologies. At z∼2.2, the ultraviolet spectra of active galaxies show possible gas outflows with velocities up to about -500 km s^{-1} that are not observed neither in inactive systems at the same redshift, nor at lower redshifts. These outflows indicate the presence of gas that can move faster than the escape velocities of active galaxies. The ejection of part of the interstellar medium can lead to a rapid decrease of the star formation in host galaxies and the morphological transformation from disky/irregular to spheroidal galaxies.

In this work we have extended the analysis to a larger sample of galaxies in order to put more stringent constraints on the outflow velocities and gas properties, and study their dependence on galaxy properties such as stellar mass, star-formation rate, and AGN luminosity. I will present the results of our spectroscopic analysis and discuss how they are contributing to uncover the key role played by AGN feedback in galaxy evolution.