Evolving ISM in galaxies: impact on star formation and active nuclei

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Abstract

We know that galaxies were forming stars at higher rates, and also with higher specific star formation rates (SSFR=SFR/M_*) in the past, and that they were more often growing their central black holes. There are now hints that high-redshift galaxies also had different ISM conditions (density, ionization parameter, etc) relative to their nearby counterparts. Are these differences solely attributed to a changing SSFR, or could they be due to a different "mode" of star formation with larger star-forming complexes in a more compact configuration and/or other factors such as a more prominent role of active nuclei? I will present a recent study using low-redshift analogs drawn from SDSS in order to empirically predict the conditions of the ISM in high-redshift galaxies, for the first time taking into account selection effects as well as luminosity evolution. As I will demonstrate, we find that selection effects mimic a more extreme ISM evolution than required by spectroscopic observations out to $z \sim 2$ from the deep fields (GOODS-N, GOODS-S, EGS), and that carefully selected nearby galaxies can be good laboratories to investigate conditions that may have been more common in the past. Another outcome of this work are improved AGN identification methods, which will be key to unveil the true galaxy-black hole connection.