Project Title: The relative role of AGN and stellar feedback on galaxy evolution

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Project Description:

It is nowadays well established that galactic outflows are a common phenomenon and play a major role in galaxy evolution. Nonetheless, the community is still debating about the relative role of feedback processes driven either by star formation or Active Galactic Nuclei (and their possible interplay) in triggering such events and on their overall impact on galaxy structure and environment.

The proposed PhD project is focused on the characterization of the impact of the feedback connected to the AGN phenomena with respect to feedback relative to the star forming processes in galaxies. The recently developed GAEA model (Hirschmann, De Lucia & Fontanot 2016) represents an ideal tool to carry out this investigation, thanks to the improved modeling of chemical enrichment (which explicitly includes the differential contribution of SNeII, SNeIa and AGB stars) and stellar feedback (which allows us to reproduce the differential assembly of galaxy populations over cosmic epochs). Moreover, in Fontanot et al. (2020) we updated the model to include an explicit treatment for AGN feedback that takes into account all physical processes involved in the AGN phenomena, from the loss of angular momentum in the cold gas at the center of model galaxies to the accretion of this material onto the central Super Massive Black Hole and the resulting feedback in the form of galactic winds, paving the way to its extensive testing again available observational constraints.

In this context, we expect the PhD student to gain considerable insight in both the numerical and observational aspects of the problem. She/he will work on he quantitative comparison of the relative impact of galactic outflows, either stellar- or AGN-driven. Thanks to the advent of recent facilities (e.g. ALMA) and instruments (e.g. MUSE), we can now routinely assess the properties and distribution of the gaseous components of galaxies in their multi-phase nature (i.e. neutral, molecular, ionized). Part of this work will be performed in close collaboration with INAF scientists with significant expertise in the analysis of observational data. Moreover, we expect the student to also work directly on the code, whose modular nature allows an easy implementation of new prescriptions (as well as modification of existing ones).