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QUENCHING STAR FORMATION NOW AND THEN: DOWNSIZING OF THE MASS FLUX DENSITY IN THE GREEN VALLEY

T. S. Gonçalves[1], K. Menéndez-Delmestre[1], J. P. Nogueira-Cavalcante[1], K. Sheth[2], and D. C. Martin[3]

The bimodality in galaxy properties has been observed at low and high redshift, with a clear distinction between star-forming galaxies in the blue cloud and passively evolving objects in the red sequence. The absence of galaxies with intermediate properties indicates that the quenching of star formation and subsequent transition between populations must happen rapidly. By using very deep spectroscopy with the DEIMOS instrument at the Keck telescope we are able to infer the star formation histories of so-called "green valley" galaxies at intermediate redshifts ($z \sim 0.8$), when the universe was half its current age Gonçalves et al. (2012). We measure the stellar mass flux density of green valley galaxies transiting from the blue cloud to the red sequence and find that this transition happens more rapidly in the past and that at $z \sim 0.8$ this process happens more rapidly for more massive galaxies. This suggests a top-down scenario in which the massive end of the red sequence forms first, representing another aspect of downsizing, with the mass flux density moving towards smaller galaxies in recent times. It remains an open question, however, which physical mechanisms are responsible for quenching star formation and how they may be more efficient at $z \sim 0.8$ than at lower redshifts. To tackle this we have recently initiated a project to detect the presence of bars at low and high redshift, and correlate their strength with the quenching timescales. This will allow us to infer the influence of secular evolution in galaxies at different epochs.

Our initial analysis shows that approximately 10% of green valley galaxies at intermediate redshift show bars, according to visual classification criteria of objects observed in the *I*-band (Lotz et al. 2008). This indicates that bars and secular evolution are not the dominant process involved in quenching star formation at these redshifts, especially when compared to the global bar fraction of 30% found in Sheth et al. (2008).

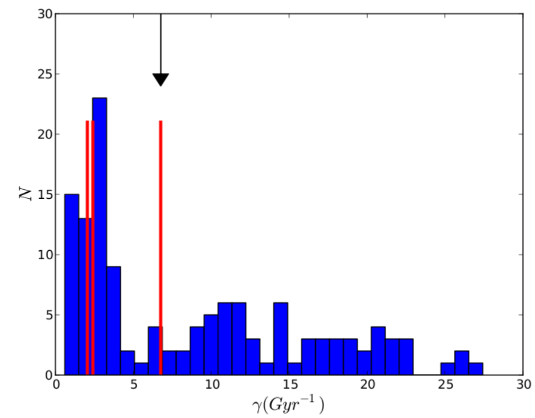

Fig. 1. Barred galaxies quench star formation at slower timescales. This histogram shows the distribution of quenching timescales as defined in Gonçalves et al. (2012). The three barred galaxies identified in this sample, indicated by vertical lines, all, have smaller or equal γ values, i.e. slower quenching, than the median, as shown by the arrow.

We intend to build a significant sample of barred green valley galaxies at low and high redshift, and to compare their quenching timescales with typical values at each epoch. Our preliminary analysis (Figure 1) suggests that galaxies undergoing secular evolution – as indicated by the presence of a bar – do evolve across the green valley at a slower pace than the typical object at $z \sim 0.8$. Larger samples and further investigation will allow us to determine whether the evolution in quenching speeds can be attributed, at least in part, to a more significant part played by secular evolution at later epochs.

For more information, we refer the reader to the work by Nogueira-Cavalcante et al. (2014) also present in this volume.

[1]Valongo Observatory, Federal University of Rio de Janeiro, Ladeira Pedro Antonio, 43, Saúde, Rio de Janeiro CEP 20080-090, Brazil.
[2]National Radio Astronomy Observatory, USA.
[3]California Institute of Technology, USA.

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