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Tracing the Impact of Dark Matter Halo Environment on Galaxy Quenching

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Understanding the processes which shut down star formation in galaxies, commonly known as galaxy quenching, is a central question in astrophysics. In this project, I investigate how a galaxy's location and motion within its group environment influence its star-forming activity, using data from the Deep Extragalactic Visible Legacy Survey (DEVILS).

Focusing on satellite galaxies, I explore two key environmental metrics: projected radial distance from the group centre (scaled by R_{100}) and the galaxy's velocity offset (ΔV) relative to the group's systemic velocity. These parameters act as proxies for infall time and interaction history within the group. I compare these dynamical indicators with galaxy star formation classifications, either passive or star-forming, derived using the stellar mass-SFR plane.

My results show a clear trend. Galaxies at smaller R/R_{100} and lower ΔV are more likely to be quenched, consistent with environmental quenching mechanisms acting over time. In contrast, galaxies at larger radii and with high velocity offsets tend to be star-forming, suggesting they are recent in-fallers not yet affected by the dense group environment. These findings support the scenario that group preprocessing and environmental effects such as ram-pressure stripping and starvation play a significant role in galaxy evolution.

This work contributes to our understanding of how galaxies transition from star-forming to passive in dense environments, using the rich spectroscopic and group catalog data from DEVILS

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