WALLABY Pre-Pilot Survey

The effects of tidal interaction on radial distribution of color in galaxies of the Eridanus supergroup

Shun Wang,[1, 2] Jing Wang[1] and Bi-Qing For[3] et al.

[1] Kavli Institute for Astronomy and Astrophysics, Peking University, Beijing 100871, China
[2] Department of Astronomy, School of Physics, Peking University, Beijing 100871, China
[3] ICRAR, The University of Western Australia, 35 Stirling Highway, Crawley WA 6009, Australia

Email:
s.wang@pku.edu.cn

Sample

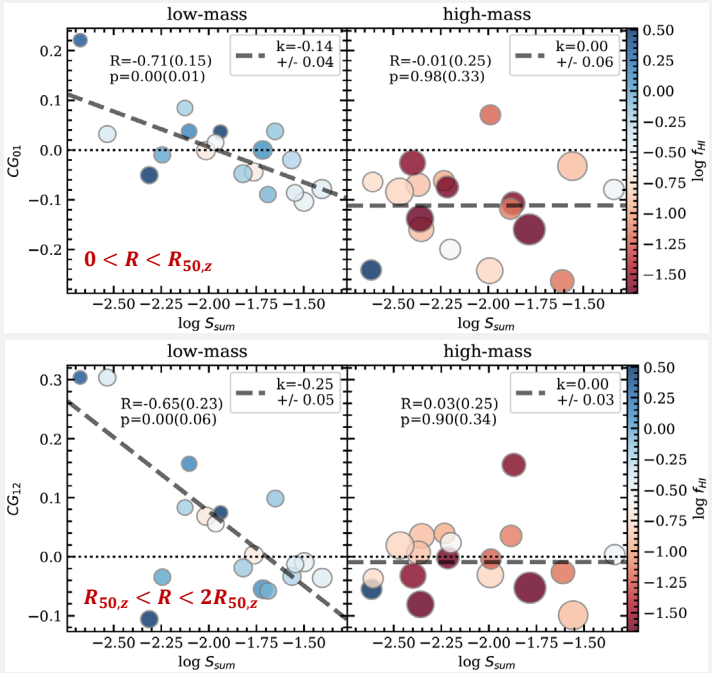
36 HI detected Eridanus supergroup galaxies from WALLABY Eridanus field, which are further divided into low-mass ($M_* < M_{*,median}$) and high-mass ($M_* > M_{*,median}$) galaxies ($M_{*,median} = 10^{9.0} M_\odot$)

Tidal parameter (S_{sum})

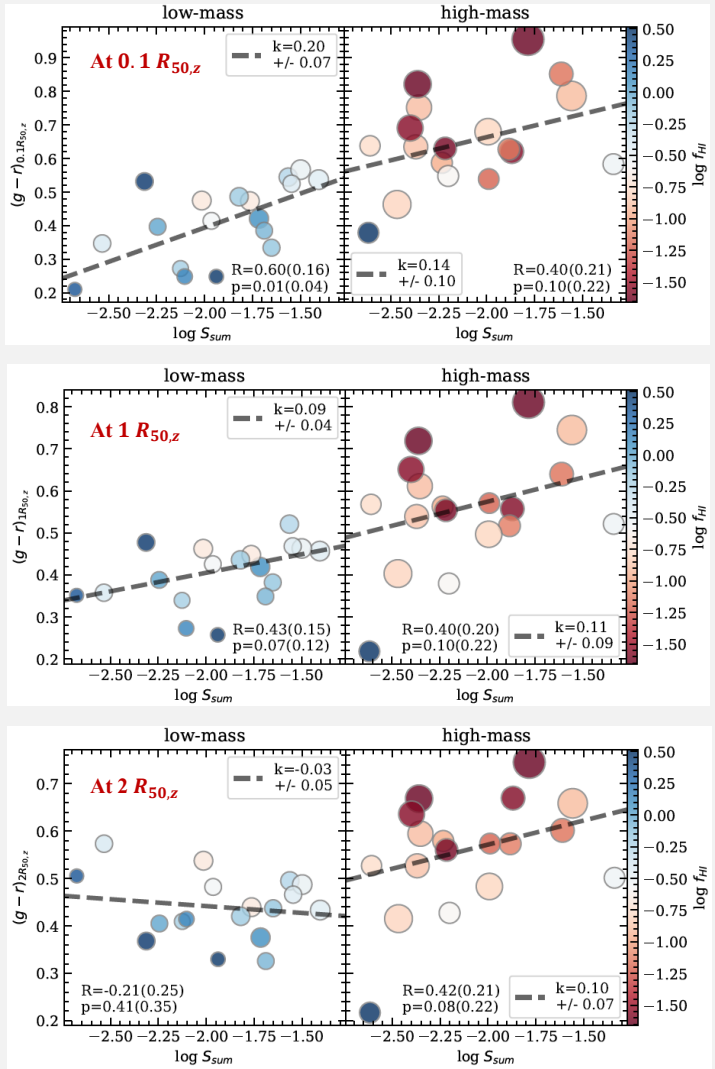
A summed tidal parameter $S_{sum} \equiv \sum_i S_i$ to quantify the summed strengths of tidal perturbation, where S_i is the tidal parameter from any single perturber

Color gradients (CG_{01} and CG_{12})

Derived via linear fit on $g - r$ color profiles in two radius ranges
Significant anti-correlations between CG and S_{sum} for low-mass galaxies
No correlation in either case for high-mass galaxies

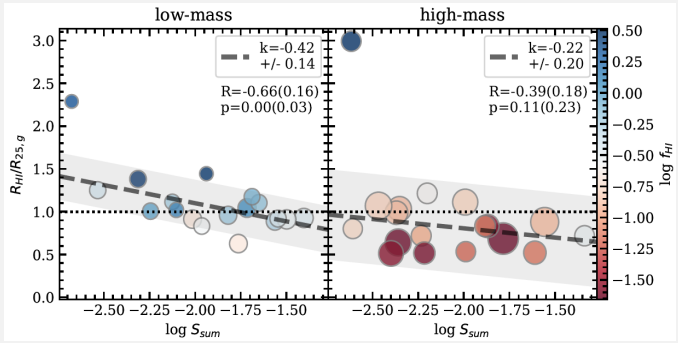


Colors at different radii $(g-r)_{0.1/1/2R_{50,z}}$



HI-to-optical disk size ratios ($R_{HI}/R_{25,g}$)

For low-mass galaxies, $R_{HI}/R_{25,g}$ significantly **anti-correlates** with S_{sum}.
For high-mass galaxies, the **anti-correlation is weak**.



Low-mass galaxies have significantly **redder centers** when having higher S_{sum}, while their outer regions are less affected and thus produce more negative CG.
When high-mass galaxies have higher S_{sum}, their **entire disks** ($R \leq 2R_{50}$) become tentatively redder.

Conclusions

Tidal interaction in the Eridanus supergroup serves as a **major mechanism for star formation quenching in low-mass galaxies**. It works by stripping the HI gas from the extended HI disk. The inner disk where star formation is concentrated is then less fueled than it would be in an unperturbed state.

The smaller HI reservoir leaves less space for the same mechanism to work in high-mass galaxies. The suppression of SFR throughout their disk is possibly due to the **halt of their normal inside-out formation** as a result of shrinking HI reservoir.