

Timescales for the Effects of Interactions on Galaxy Properties and SMBH Growth

O’Ryan et al. 2025, arXiv: 2504.00103

Introduction

- Galaxy interaction → Morphology, star formation, AGN
- Effect of galaxy interaction through merger stage
- Need large sample of interacting galaxies
- Use their large interacting galaxy catalog

Data & Merger stage classification

Interacting galaxy catalog by O’Ryan+2023

+ COSMOS survey + Stellar mass limit

→ 3,162 galaxies with 556 pairs

Merger stage with visual morphology & angular separation

- (1) Separated: close pair
 - (2) Pericenter: morphologically disturbed & overlapping
 - (3) Apocenter: morphologically disturbed & distinct
 - (4) Merging:
- Capture a different part of the dynamical timescale of the interaction

Fig. 4 Example of four stage interaction

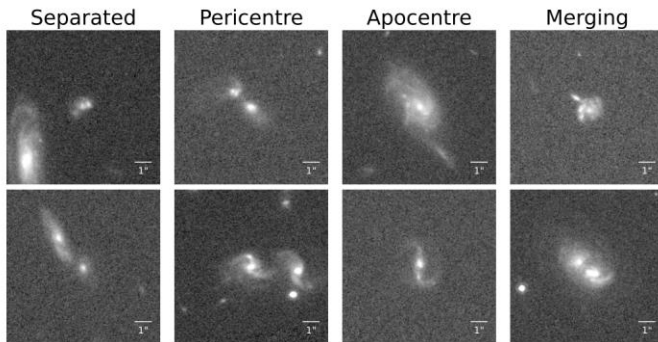
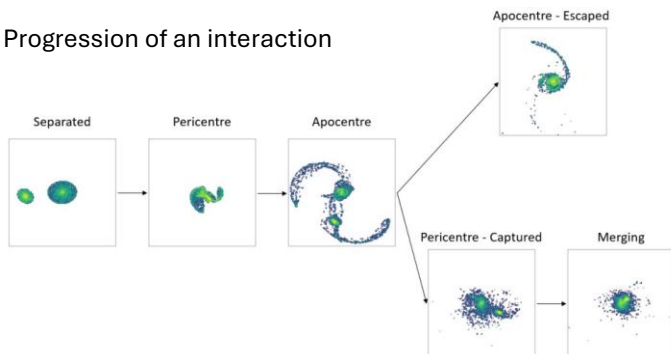


Fig. 5 Progression of an interaction



Star formation with interacting stage

- Stellar mass distribution does not change
- SFR distribution evolve with interaction stage (details in Fig. 11)
- Mechanism of SF enhancement is dominant from separated to pericenter and in the final coalescence
- SFR enhancement vs projected separation = Different behavior depending on interaction stages
 - Pericenter = enhancement does not change
 - Apocenter = decrease 1.8 (10kpc) → 1.0 (125kpc)

Fig. 10

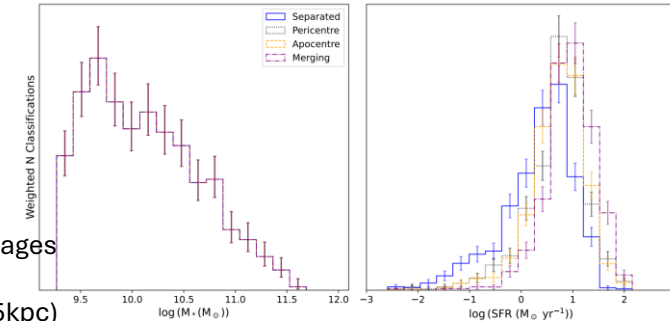


Fig. 11

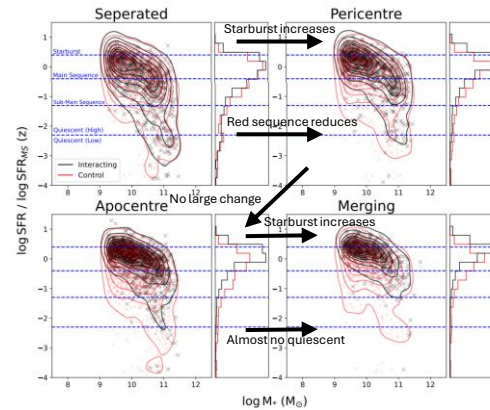
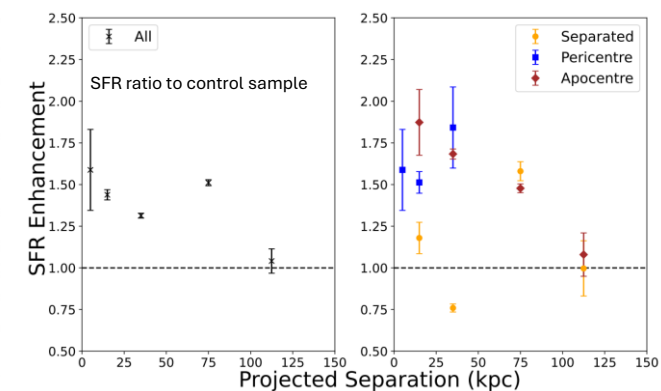
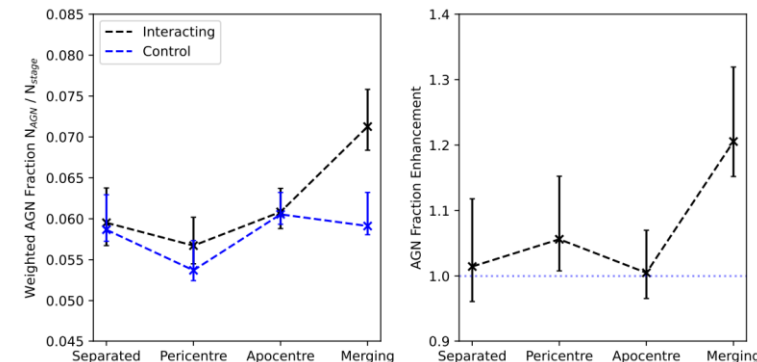


Fig. 13



AGN with interacting stage

- AGN fraction remains constant until the final coalescence, where AGN fraction enhanced by 1.19
- Consistent with other works about merging galaxies or post starburst galaxies
- These AGN are detected in radio, rather than X-ray



Summary

- It is important to consider the morphological stage when considering interaction (only projected separation is not enough)
- Need a larger sample of correctly staged galaxies → SF enhancement, AGN fraction