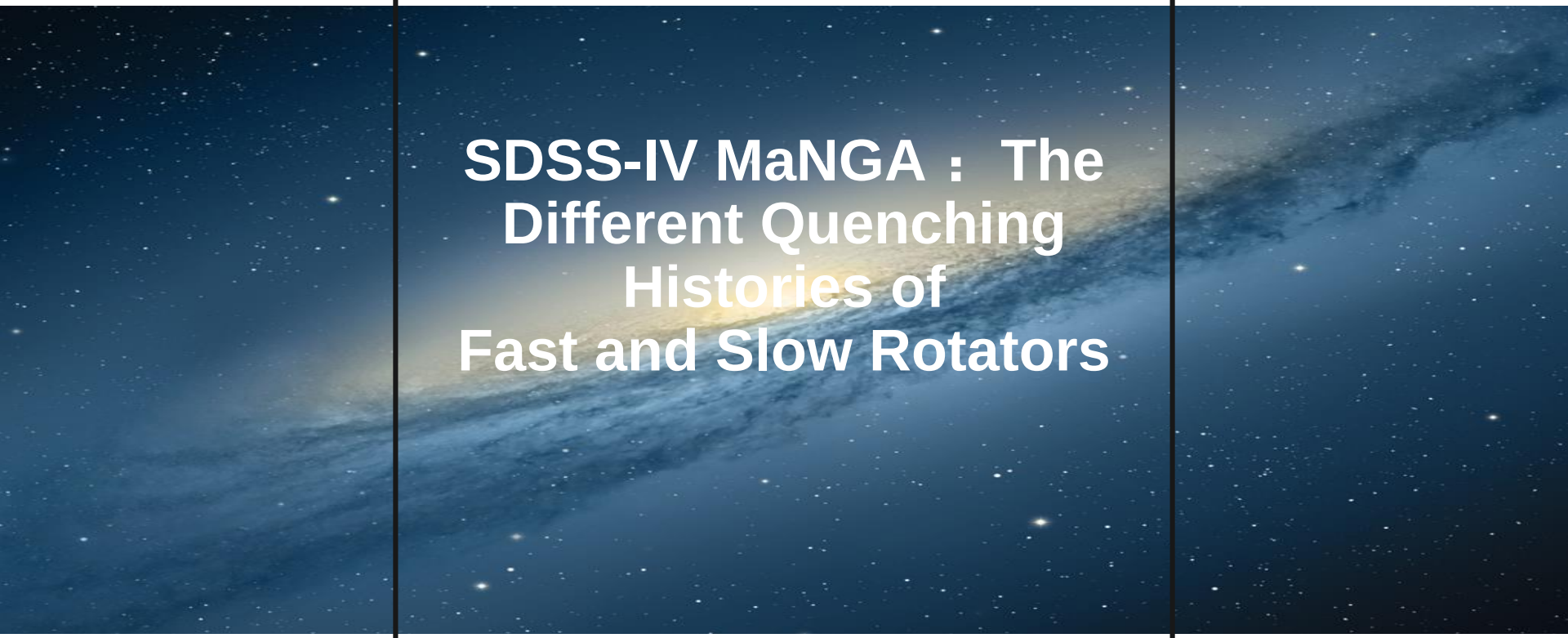


# SDSS-IV MaNGA： The Different Quenching Histories of Fast and Slow Rotators

刘蓉蓉 2017.9.29

## paper

- ★arXiv:1709.09175v1
- ★Title：SDSS-IV MaNGA: The Different Quenching Histories of Fast and Slow Rotators
- ★Author：R. J. Smethurst

## purpose

- ★Do the theorised different formation mechanisms of fast and slow rotators produce an observable difference in their star formation histories?

## method

- ★Use u − r and N U V − u colours from SDSS and GALEX and an existing inference package, STARPY, to conduct a first look at the onset time and exponentially declining rate of quenching of these galaxies.

$$SFR = \begin{cases} i_{sfr}(t_q) & \text{if } t < t_q \\ i_{sfr}(t_q) \times exp\left(\frac{-(t-t_q)}{\tau}\right) & \text{if } t > t_q \end{cases} \quad (3)$$

- ★Anderson-Darling test

# data

★MaNGA sample， SDSS & GALEX Photometry，identify slow and fast rotators

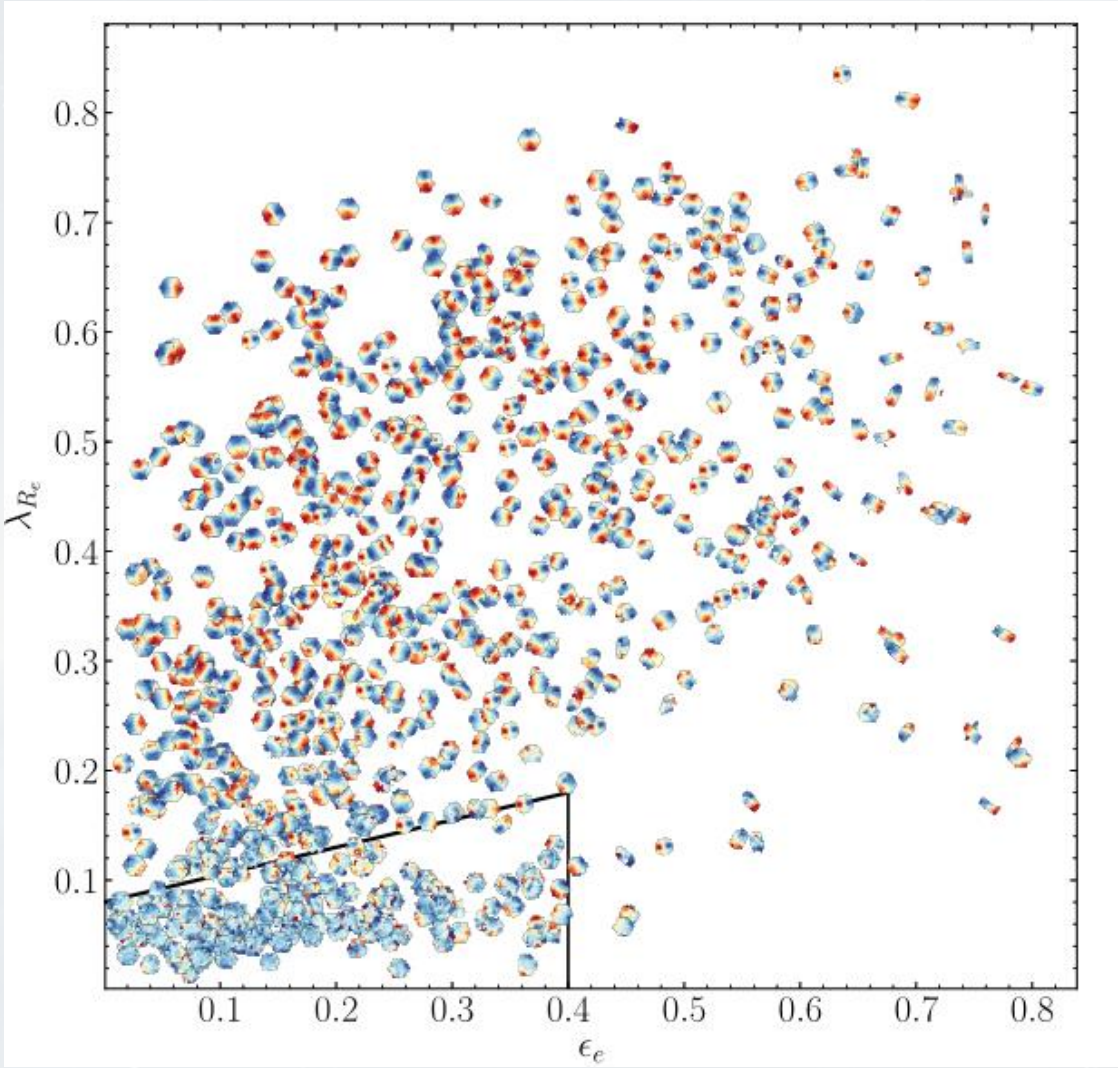
★Specific stellar angular momentum

$$\lambda_{R_e} = \frac{\sum_{i=1}^{N} F_i \; R_i \; |V_i|}{\sum_{i=1}^{N} F_i \; R_i \; (V_i^2 + \sigma_i^2)^{1/2}}, \qquad (1)$$

★Slow rotators

$$\lambda_{R_e} < 0.08 + \frac{\epsilon_e}{4} \qquad \text{with} \qquad \epsilon_e < 0.4. \qquad (2)$$

# data



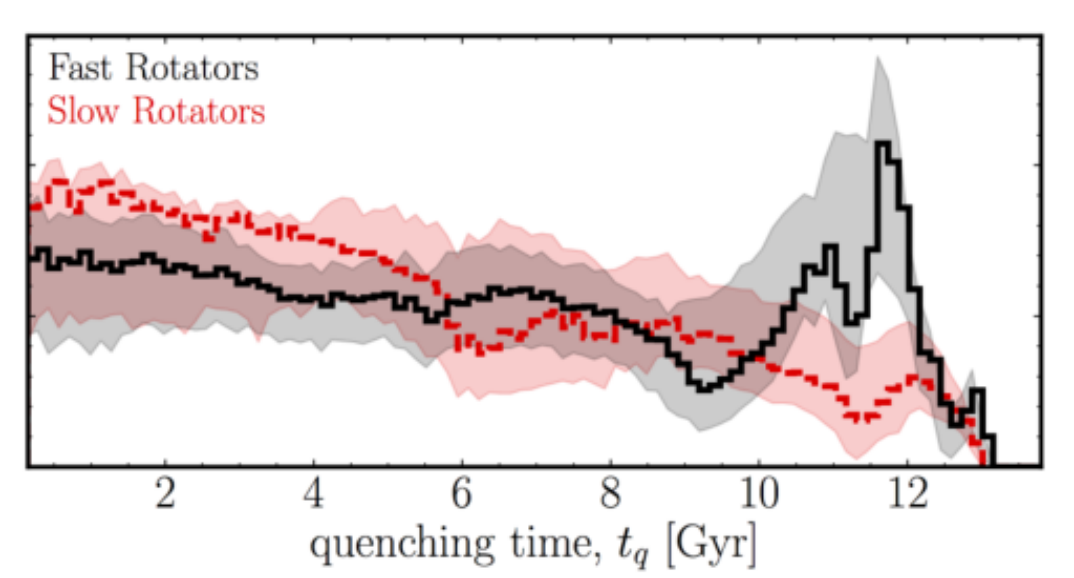
## result

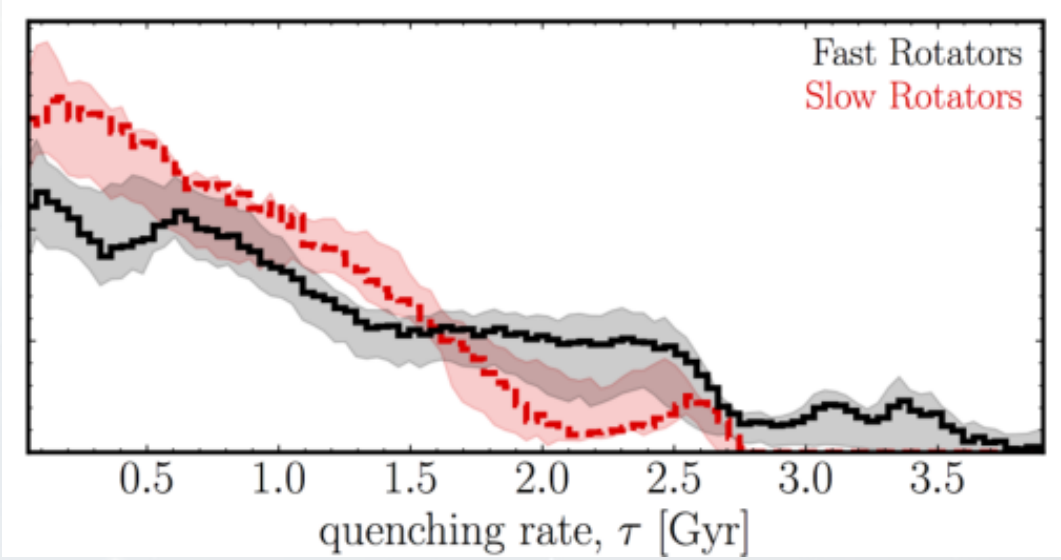
- ★Given some statistical tests, the only differences: kinematics, colours, position within their group halo
- ★Result: the distribution of the inferred quenching rates of fast and slow rotators are statistically distinguishable

## result

- ★Quenching is more likely to occur at rapid rates ($\tau <\sim 1$ Gyr) for slow rotators,in agreement with theories suggesting slow rotators are formed in dynamically fast processes, such as major mergers.
- ★Fast rotators quench at a much wider range of rates than slow rotators, consistent with a wide variety of physical processes such as secular evolution, minor mergers, gas accretion and environmentally driven mechanisms.
- ★A subset of the fast rotators quench at these same rapid rates as the bulk of the slow rotator sample.

# result


Fast Rotators
Slow Rotators
2
4
6
8
10
12
quenching time, $t_q$ [Gyr]


Fast Rotators
Slow Rotators
0.5
1.0
1.5
2.0
2.5
3.0
3.5
quenching rate, $\tau$ [Gyr]

## conclusion

- ★The theorised different formation mechanisms of fast and slow rotators produce an observable difference in their star formation histories
- ★But both classes of galaxy may be able to quench, and therefore form, via major mergers.

## discuss

★This result combined with the findings of recent simulations showing disc survival in gas-rich major mergers (Bois et al. 2011; Pontzen et al. 2016; Sparre & Springel 2016), suggests that the total gas mass fraction within a pair of merging galaxies, is what will ultimately decide the kinematic fate of a galaxy.