

Multi-wavelength study of star formation properties in barred galaxies

Zhi-Min Zhou¹, Chen Cao², and Hong Wu¹

¹National Astronomical Observatories, Chinese Academy of Sciences, Beijing 100012, China
email: zmzhou@bao.ac.cn

²Shandong University at Weihai, Weihai, Shandong 264209, China

Abstract. Stellar bars are important internal drivers of the secular evolution of disk galaxies. Using a sample of nearby barred galaxies with weak and strong bars, we evaluate the correlations between star formation properties in different galactic structures and their associated bars, and try to interpret the complex process of bar-driven secular evolution. We find that weaker bars tend to associate with lower concentric star formation activities, while stronger bars appear to have large scatter in the distribution of the global star formation activities. In general, the star formation activities in early- and late-type galaxies have different behavior, with similar star formation rate density distributions. In addition, there are only weak trends toward increased star formation activities in bulges and galaxies with stronger bars, which is consistent with previous works. Our results suggest that the different stages of the evolutionary sequence and many factors besides bars may contribute to the complexity of this process. Furthermore, significant correlations are found between the star formation activities in different galactic structures, in which barred galaxies with intense star formation in bulges tend to also have active star formation in their bars and disks. Most bulges have higher star formation densities than their associated bars and disks, indicating the presence of bar-driven evolution. Therefore, we derived a possible criterion (Figure 1) to quantify the different stages of a bar-driven evolutionary sequence. Future work is needed to improve on the uncertainties of this study.

Keywords. Secular Evolution, Barred Galaxies, Star Formation

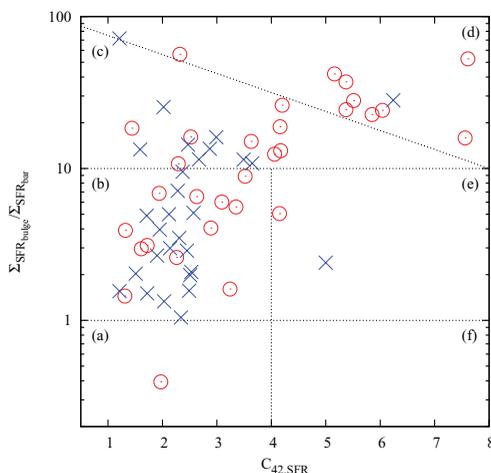


Figure 1. The possible criterion to quantify the different stages of bar-driven secular evolution. From (a) to (d), the evolutionary stages are from early to late, while stage (e) and (f) may be the results of other effects. Red circles are for early-type galaxies and blue crosses for late-type ones.