Study dust-obscured star formation in galaxies with *JWST/MIRI*

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Abstract

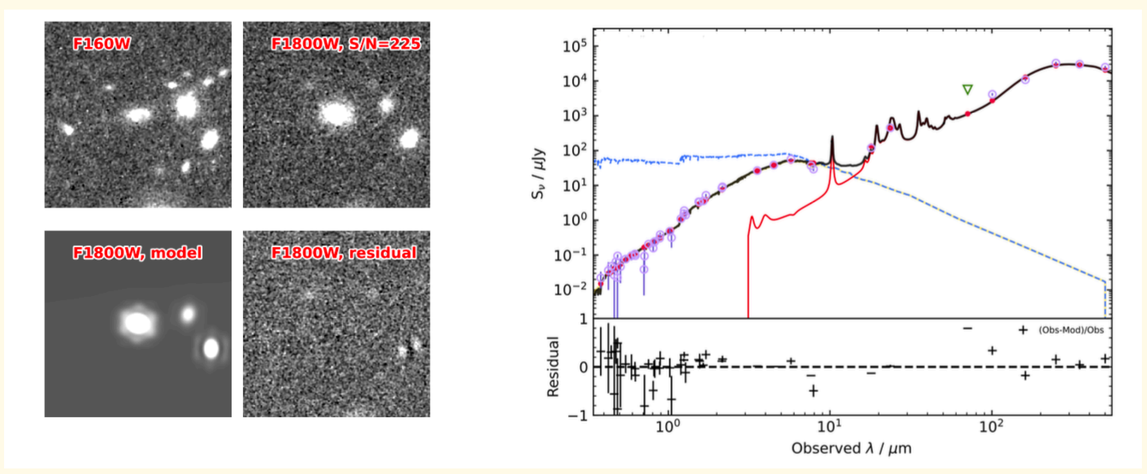
By studying the morphology of the star-forming components in SFGs using JWST/MIRI, and comparing with the stellar components from rest-frame optical. We found that the structural evolution of the stellar components of SFGs is mainly dominated by an inside-out secular growth. However, this secular growth might be interrupted by compaction phase(s) triggered by either internal or external mechanisms, which build dominant central stellar bulges as those of QGs.

Aim

We study the morphology of the star-forming components in SFGs to reveal the mechanisms that drive the structural evolution of their stellar components.

Sample and Methodology

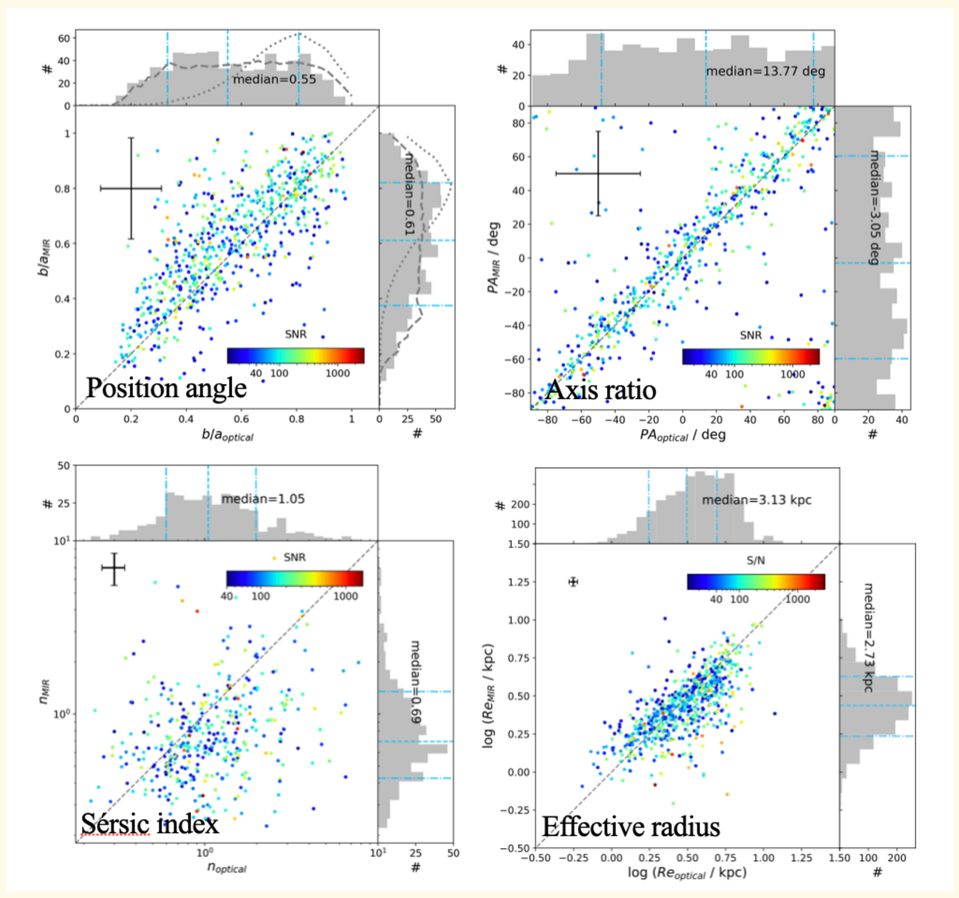
We used high resolution observations at 18 μm from the Mid-Infrared Instrument (MIRI) onboard the James Webb Space Telescope (JWST) taken as part of the Public Release IMaging for Extragalactic Research (PRIMER) survey to measure the morphology of star-forming components in 665 SFGs at $0 < z < 2.5$ and with $M_* > 10^{9.5} M_\odot$. We fitted single Sérsic models to get the mid-infrared (MIR) structural parameters of these galaxies. The rest-frame optical morphology was taken from the literature and the effects of radial color gradients (due to dust or stellar aging) were corrected to obtain the intrinsic structural parameters for the stellar components of these galaxies. We used SED fitting code CIGALE to derive various galaxy properties such as stellar mass and star formation rate (SFR).



Left: 10″ × 10″ cutouts of the HST F160W and MIRI F1800W images, and of the GALFIT model and residual images. Right: Best SED fitting of these galaxies as obtained by CIGALE.

We are able to constrain and compare the morphologies of star-forming and stellar components, of a mass-complete sample of ~670 SFGs down to and up to z~2.5.

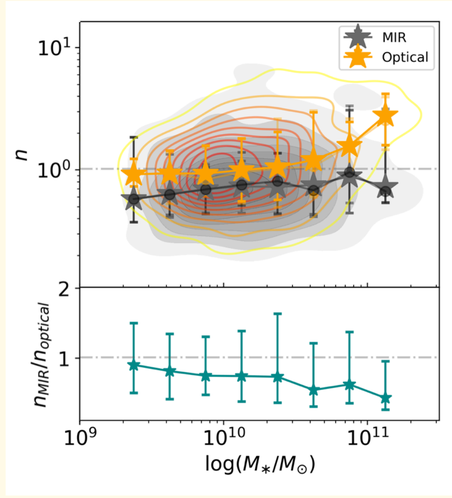
Overall structures



For the majority of SFGs:

- **The stellar and star-forming components are aligned with each other well** ($b/a_{MIR} \sim b/a_{opt.}, PA_{MIR} \sim PA_{opt.}, Re_{MIR} \sim Re_{opt.}$)
- **Both of them exhibit disk-like structures** ($n \sim 0.7$ **or** 1**, and flat** b/a **distribution**)

Bulge formation



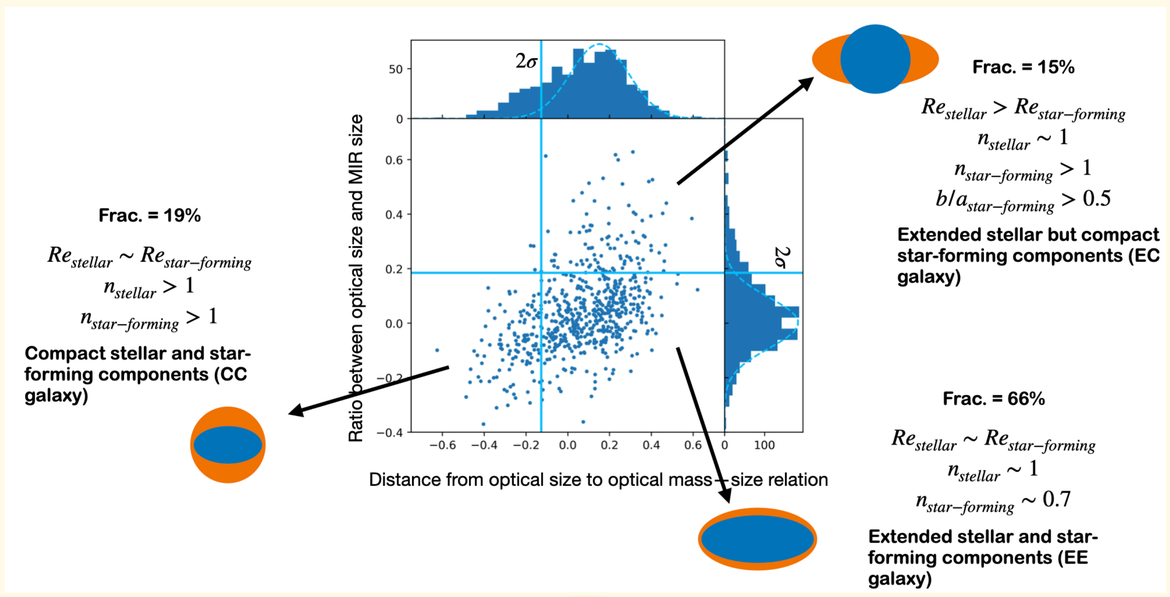
- **The optical Sérsic index increases with the stellar mass**

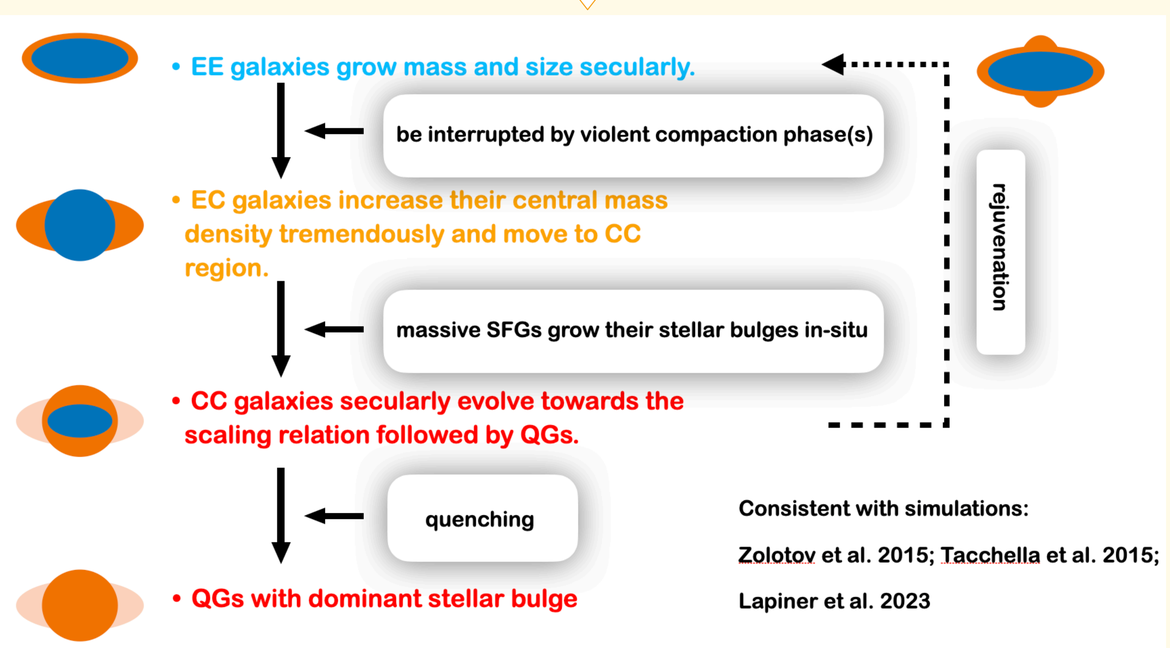
  => most massive SFGs have dominant stellar bulge

- **The MIR Sérsic index on average ~0.7 at all stellar masses**

  => their star-forming components still remain disk-like

Structural evolution





We further confirm the conclusion with NIRcam!

find the paper: https://arxiv.org/pdf/2406.11571