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CLEAR: The Evolution of Spatially Resolved Star Formation in Galaxies between $0.5 \lesssim z \lesssim 1.7$ using Hα Emission Line Maps

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まとめ：z=0.5–1.7銀河のHaマップ（WFC3 G102, 3D-HST, KMOS）から、Haの分布は星に比べて1.2倍広がっている。Inside-out evolutionか？

[背景]

- ΛCDMの簡単なモデルだとDM haloが成長していくと、銀河もより大きな半径で星形成をおこすはず。実際にはそんなにシンプルではないが。
  - 一番簡単な検証は、銀河がinside-out growthしてるか
  - z~1 : Nelson+12, etc… (3D-HST)
  - z~1.7 : Wilman+20 (KMOS3D)
- 宇宙の星形成はどの様にquenchしてきているのか？
  - z~1銀河団ではout-side-in quench <= ram pressure strip
  - z=2.5だと sub-dominant (Suzuki+19)
- z=0.5–1.5でquenchを引き起こすプロセスが変わる？
  - z<1ではself/mass quenchingとenvironmental quenchingは切り分け可能
  - z>1だと、environmental quenchingに星質量依存性が(重いものほど環境依存性大)

[やったこと]

- CLEAR サーベイ : CANDELS Lyman-A Emission at Reionization Survey
  - HST-WFC G102スリットレス分光
  - もともとはz=6.5–8.2 LAEをターゲットにしたもの
  - z~0.22–0.75銀河の空間分解した星形成をさぐる
  - 582 SFG, 4つの質量ビンでスタッキング
- 他のサーベイデータと比較
  - z=0.7–1.5 (3D-HST　G141スリットレス分光)
  - z~1.7 (KMOS3D) : 281天体

[結果]

- Reff Haは Reff contにくらべて1.2倍大きい => inside-out growth (図6)
  - この比は赤方偏移進化せず。Inside-out growthのスピードは変わっていない (図8)
  - IllustrisTNGのシミュレーション結果とよく合う => ダスト吸収の影響は考えなくていいだろう。(図10)
- Σ 1kpc Ha/ Σ 1kpc cont (図8)
  - z=1に比べて20%くらい減っている。=> Haのプロファイル進化が原因。
  - 星質量依存性あり(星質量が大きいほどHaが広がっている) : z=1.7 (KMOS3D)ではそうなってないが…
- やはりinside-out quenchingか。

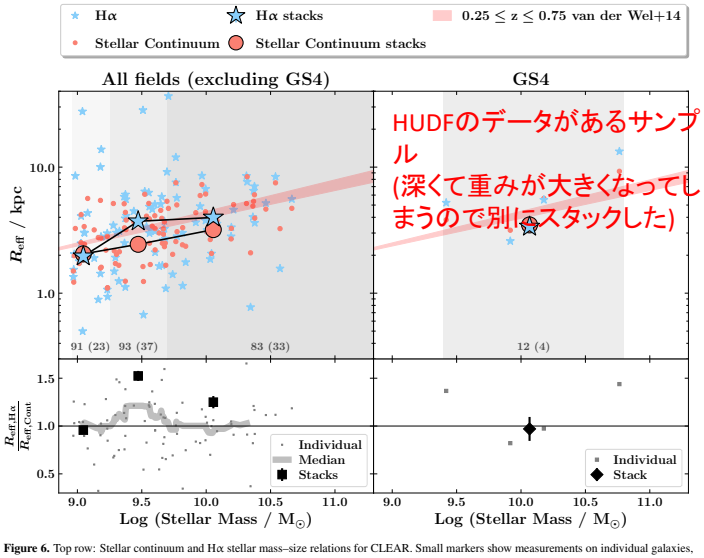


Figure 6. Top row: Stellar continuum and Hα stellar mass–size relations for CLEAR. Small markers show measurements on individual galaxies,

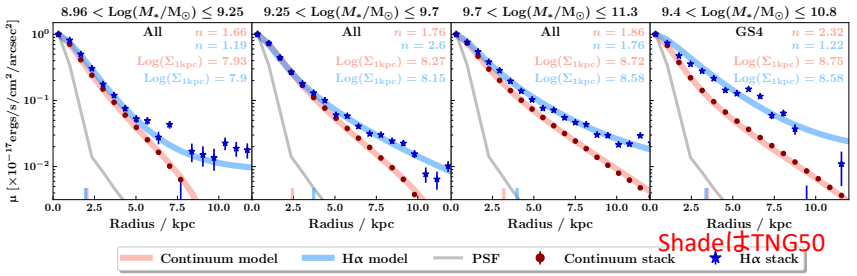
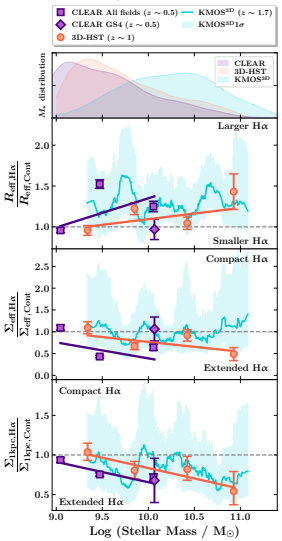
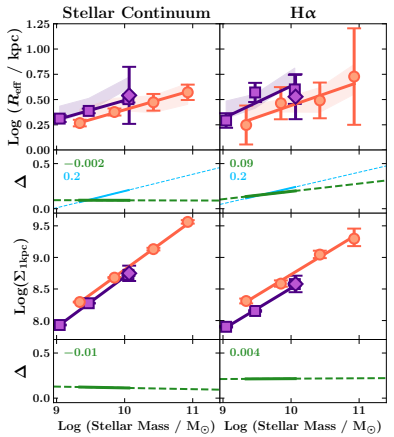
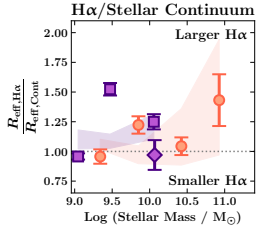


Figure 7. Normalized surface brightness profiles of the CLEAR stellar continuum and Hα stacks along with their GALFIT models and point







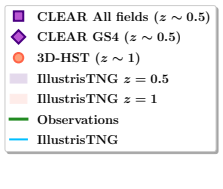


Figure 10. Left: The stellar mass–size (top row) and Σ_{1kpc}–stellar mass relations (third row) for the stellar continuum and Hα emission measured

Figure 8. Evolution of Hα to stellar continuum morphologies for

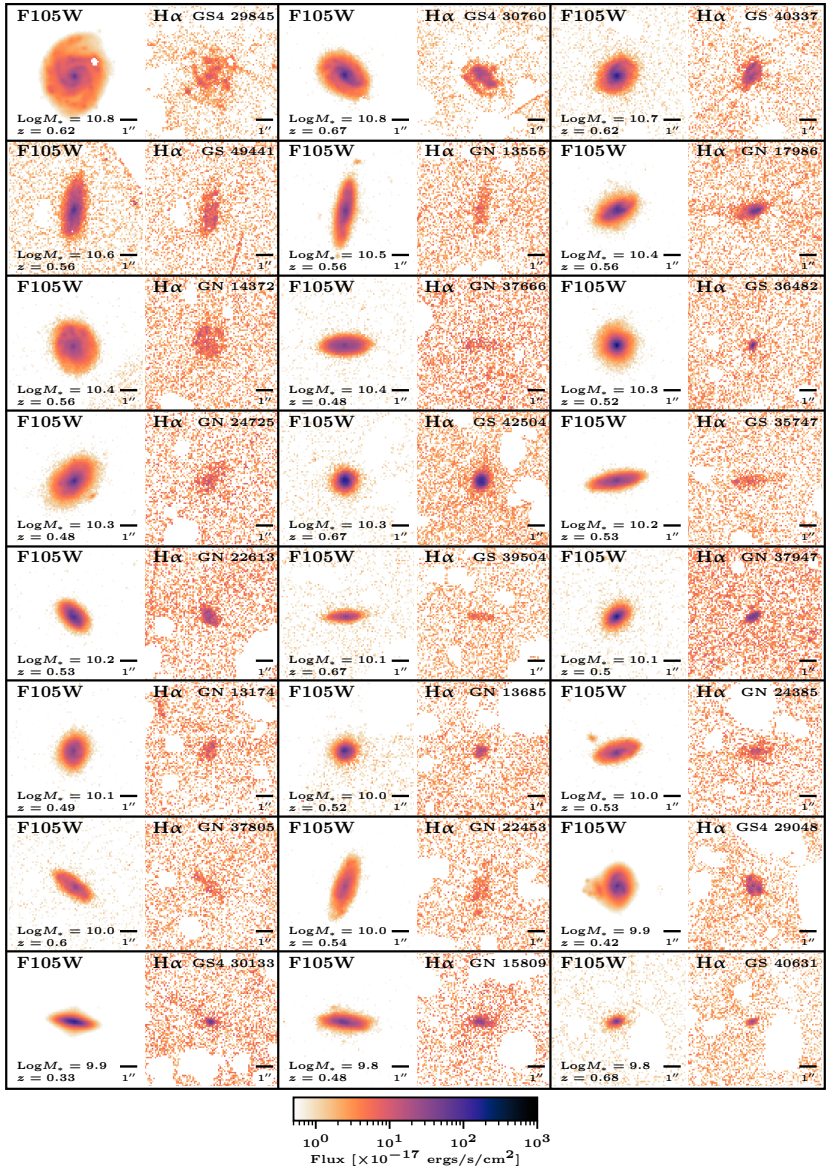


Figure 1. Zoomed-in regions (89 × 89 pixels, pixel scale = 0.1″) of *individual* stellar continuum and Hα thumbnails for select galaxies in the

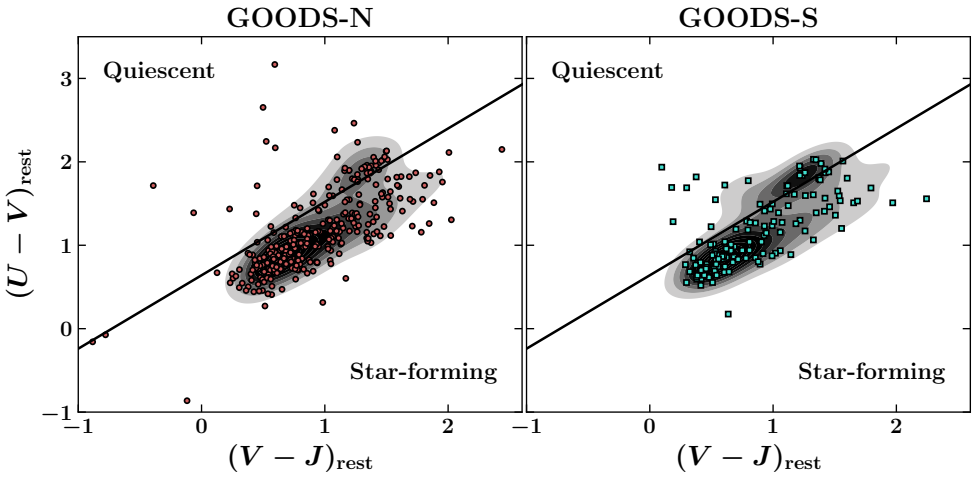


Figure 3. *UVJ* color separation (solid black line) applied to our sample to select star-forming galaxies during the sample selection process. See Section 3.2.1 for details. Background contours show the full photometrically selected sample between $0.22 \lesssim z \lesssim 0.75$ and $\mathrm{Log}(M_*/\mathrm{M}_\odot) \gtrsim 8.96$. Markers show all galaxies in CLEAR that pass the first 3 steps of sample selection (see Table 1) with stellar masses $\mathrm{Log}(M_*/\mathrm{M}_\odot) \gtrsim 8.96$.

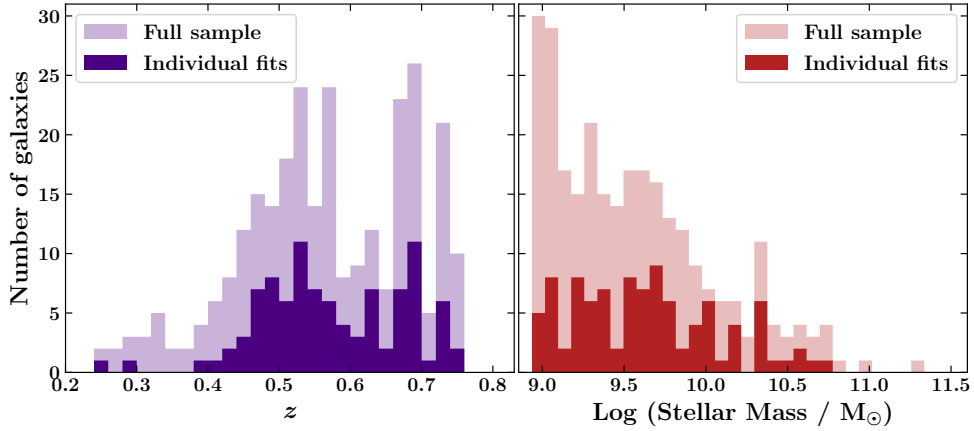


Figure 4. Grism redshift (left panel) and stellar mass (right panel) distributions for galaxies in the CLEAR sample used in this study. Full sample shows the galaxies that go into the stacks. Individual fits show the distributions for those galaxies that obtained good quality individual fits.