JWST AND ALMA IMAGING OF DUST-OBSCURED, MASSIVE SUBSTRUCTURES IN A TYPICAL $z \sim 3$ STAR-FORMING DISK GALAXY

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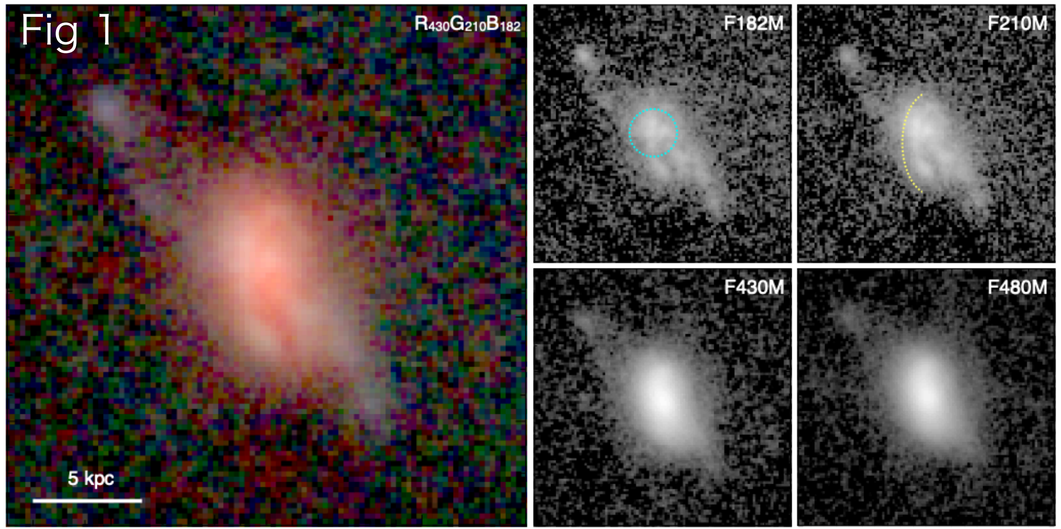
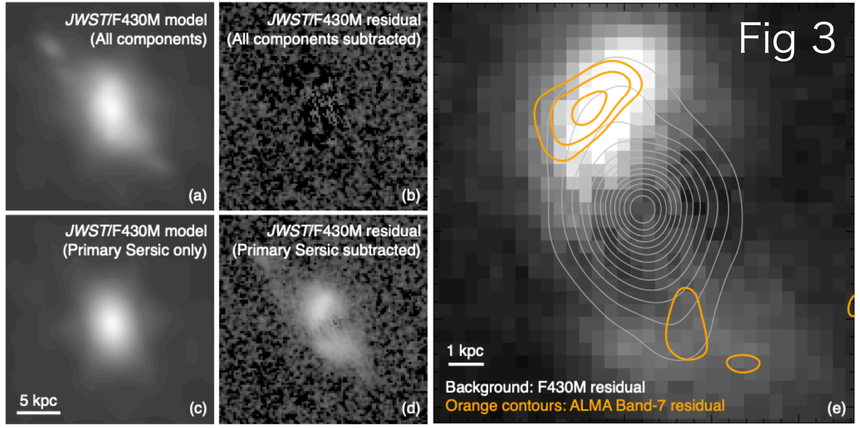
- ALMAにより、宇宙の星形成の大部分を担うz=1~4の星形成銀河 (SFG) の無バイアスな探査が進展
  - コンパクト (0.5-1 kpc) な星形成領域 (100~300 M_sun yr^-1)
  - 可視 (星質量) の広がりの1/2-1/5
  - Sub-0",1での観測でも中心星形成領域はとても滑らか
- far-IR/submmとopticalの両方でoff-center構造を検出したい
  - 渦巻き構造、ディスク不安定性
  - far-IR/submmで明るい構造はdustyなのでopticalで暗い
    → JWST

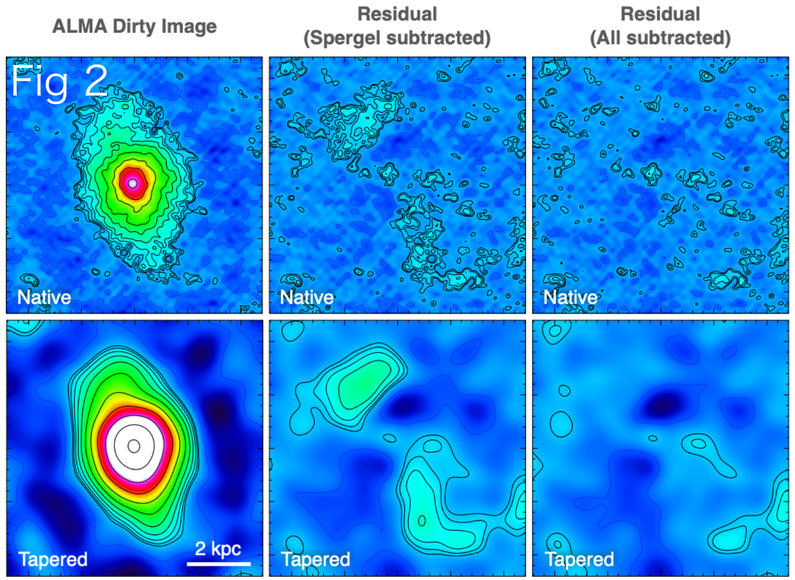
Target: UDF2

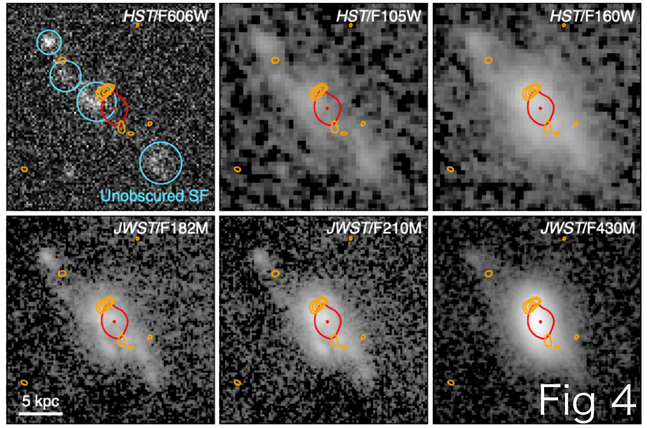
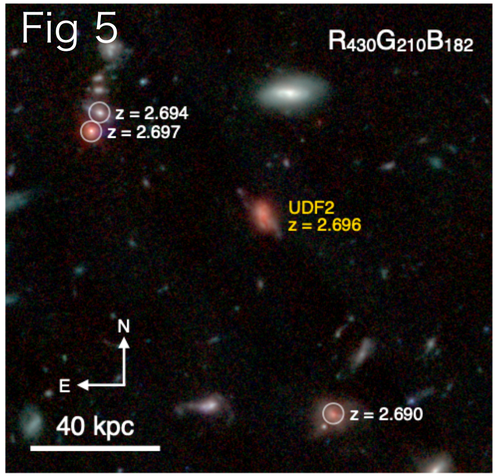
- z=2.69の典型的 (MS) なSFG
- SFR ~ 260 M_sun yr^-1, log M* ~ 10.9 M_sun
- 200 pcスケールでsmooth disk @ ALMA 240μm (42x30 mas res.)
- JWST/NIRCam ← new data
- Overdense regionっぽい (Fig. 5)





- JWST NIRCam image (Fig. 1)
  - 基本的には乱れた構造がなく滑らか
  - 短波長側ではclumpやarcのような構造が見られる
- ALMA データの再解析 (Fig. 2)
  - Visibility map上でSersic fitをして、残差マップを作る
  - 北東と南西方向に構造を確認 (それぞれ、総フラックスの~5%)
- NIRCamデータのSersic fit (Fig. 3)
  - Sersic fit (n=0.98) の残差はALMAデータの構造と場所が一致
  - フラックス割合: 北東 23%, 南西 10%
  - on-going SFなoff-center構造





- off-center構造と銀河全体の比較 (Fig. 5)
  - HST (rest 160Å) で見えていたunobscured SFとは空間的にズレる
  - JWST imageの短波長側に見える特徴はless dustな構造の一部っぽい
- Northern ridgeの特徴
  - SFR ~ 13 M_sun yr^-1 (10-20 % of total)
  - log M* ~ 10.2 M_sun (~5 % of total)
  - Off-center SFはspiral armの形成、もしくはminor mergerやinteractionなど
  - Gas-rich diskのsimulationで予想されるSF clumpより大きく、SFRも高い
  - より高分解能で観測しないと結論はつかない