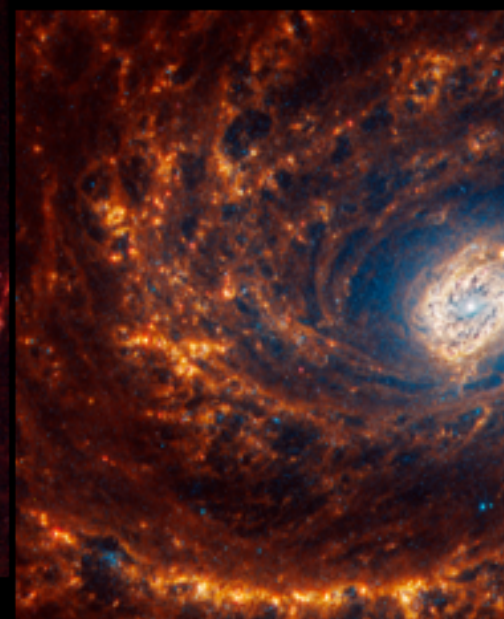
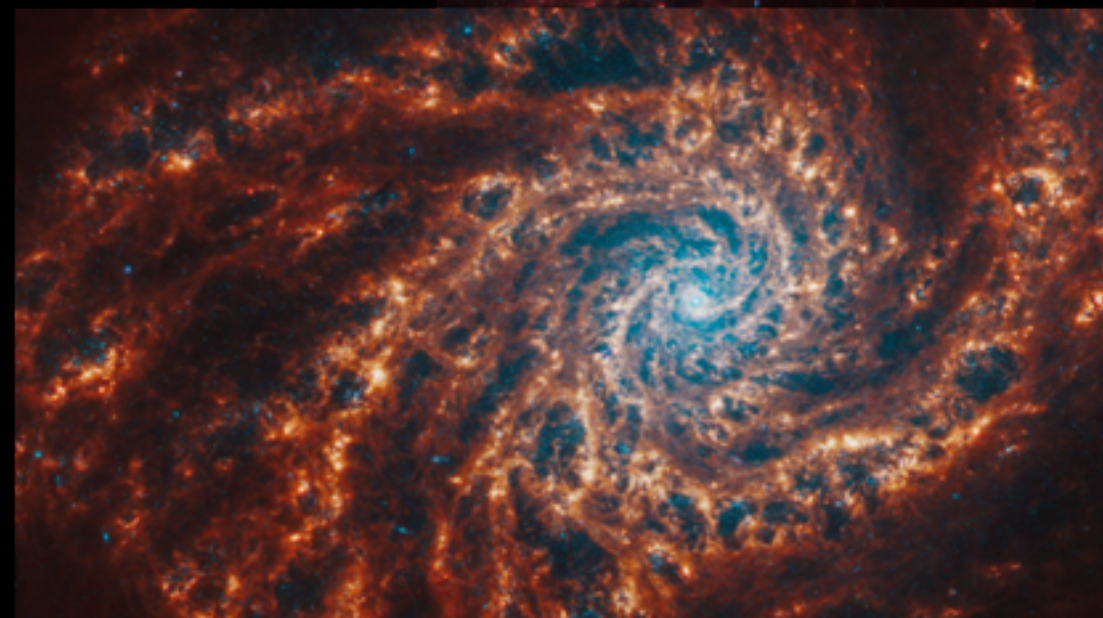


What mechanism(s) is inhibiting the formation of massive stars in central molecular gas reservoirs?



Eva Schinnerer
(MPIA)

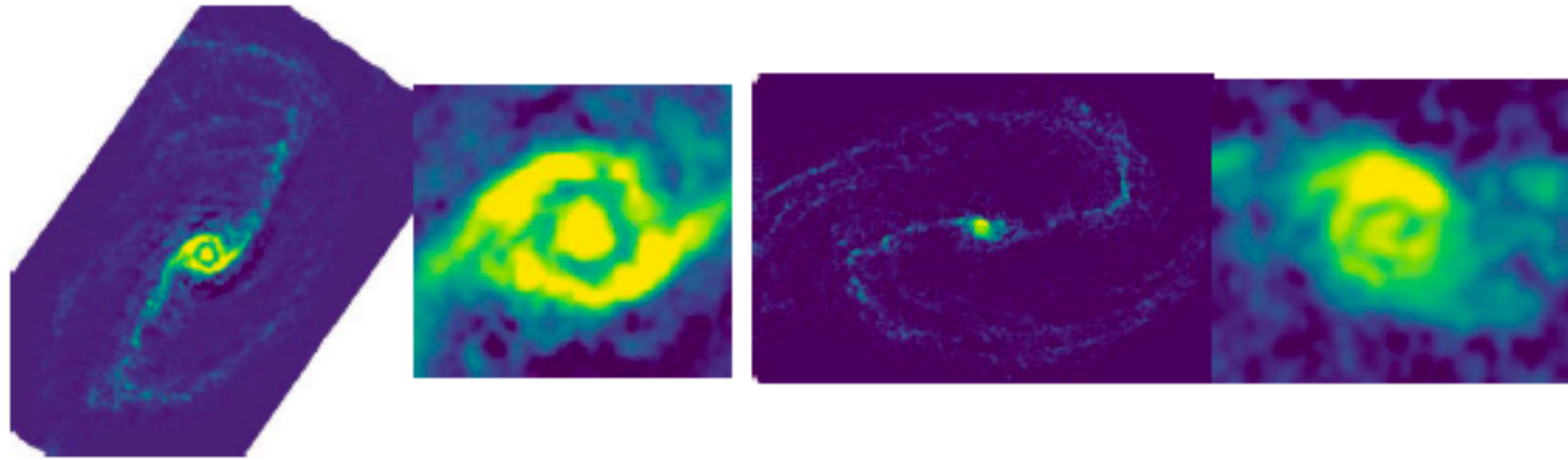
Phangs

PAH
old stars

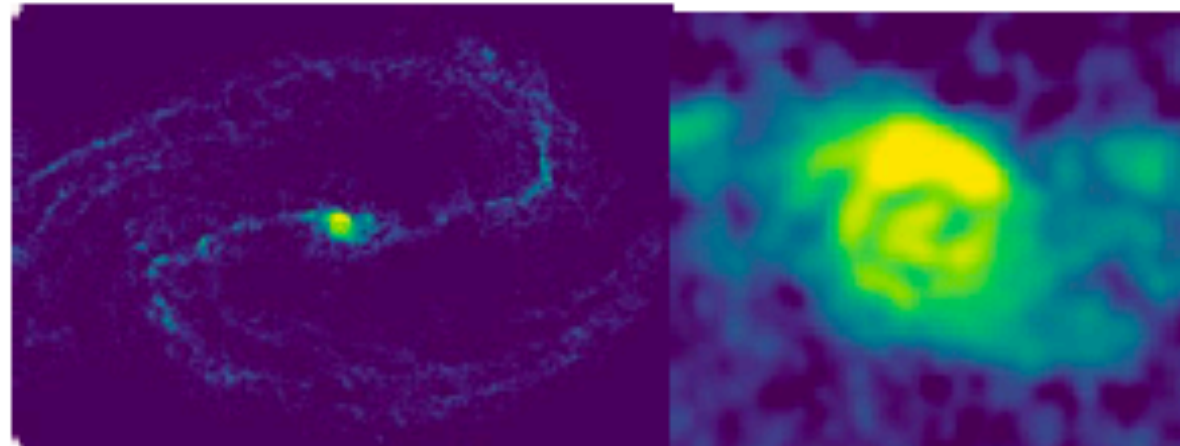
PI Lee; Williams et al. (2024)

extragalactic gas-rich galaxy centers

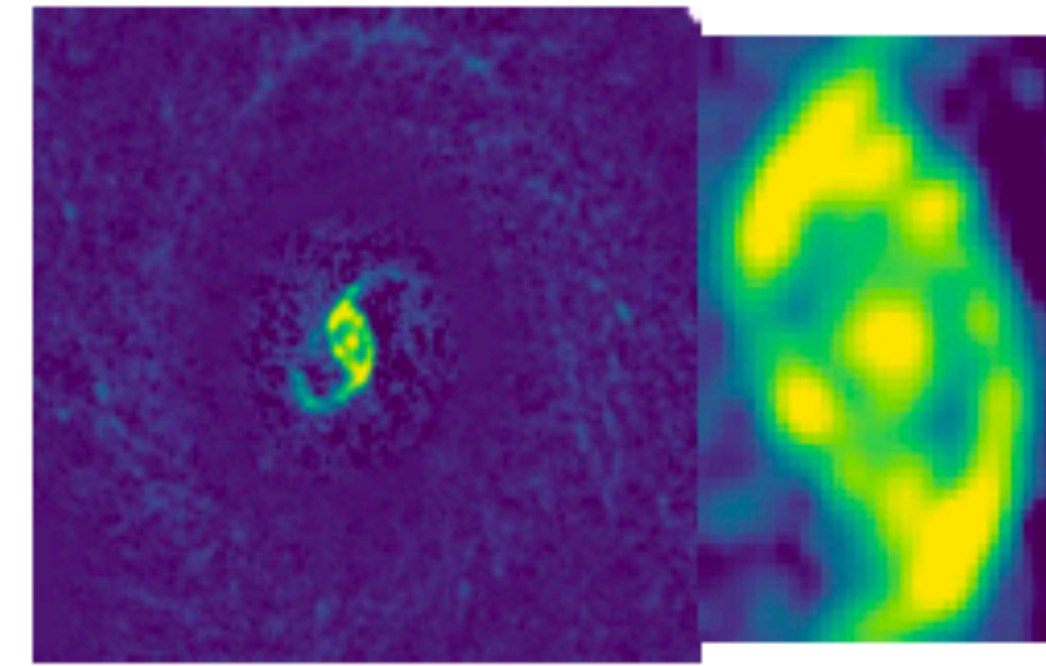
NGC1097



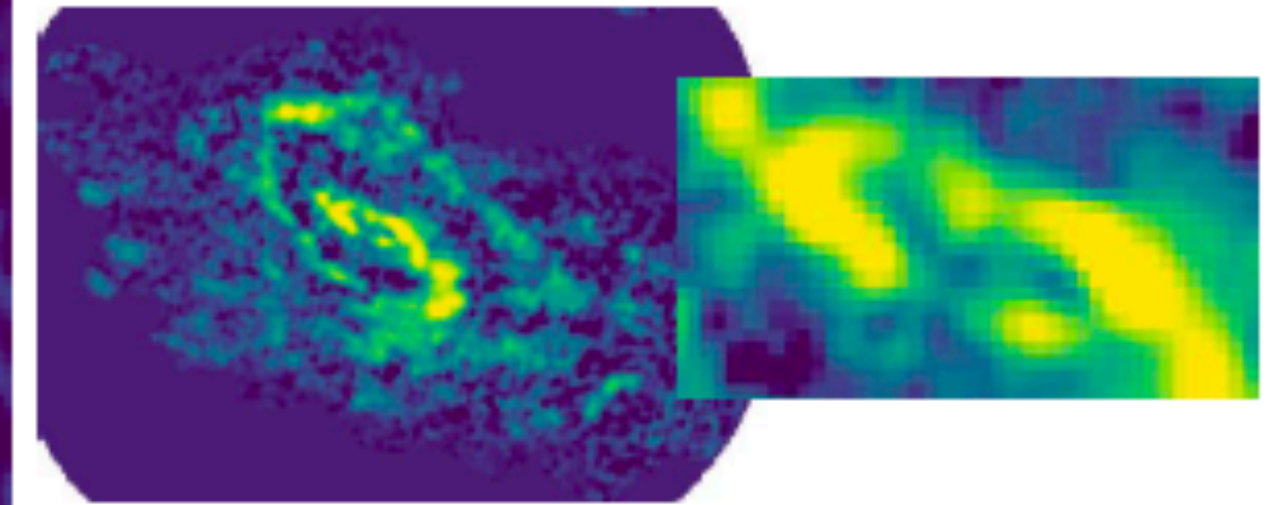
NGC1300



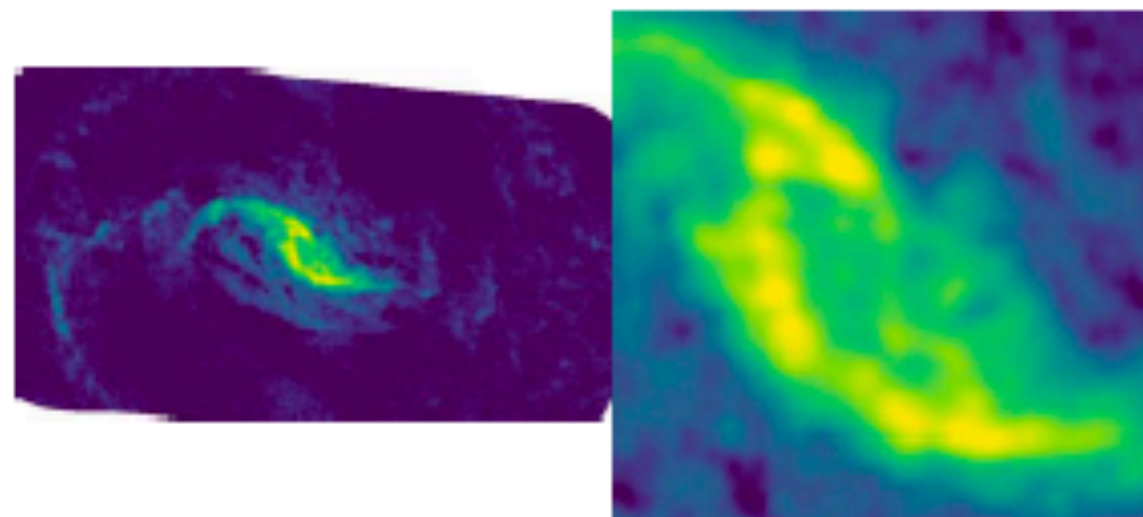
NGC3351



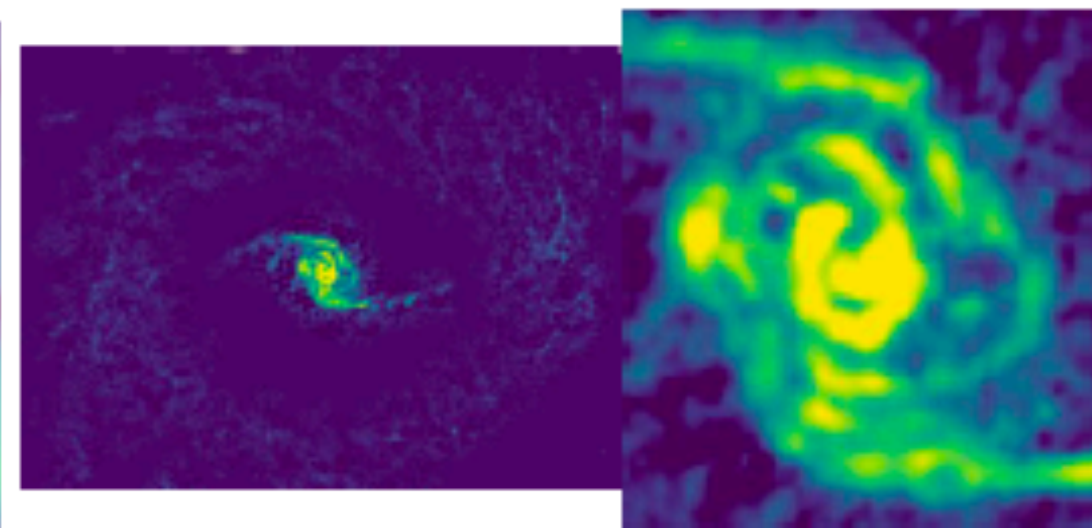
NGC3489



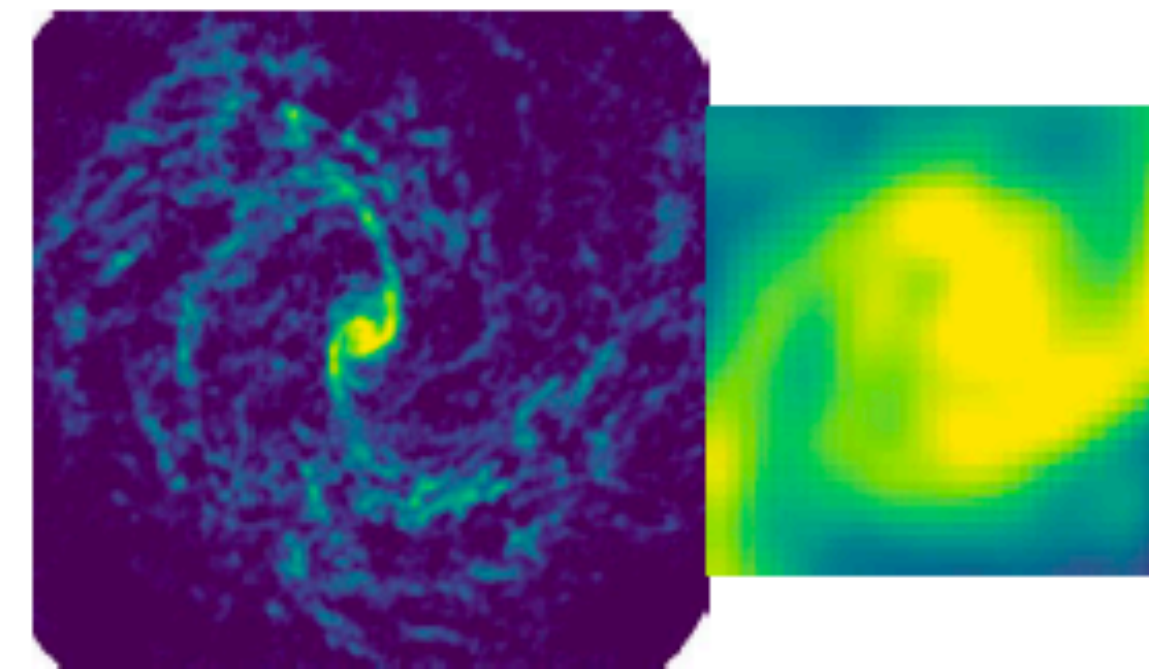
NGC1365



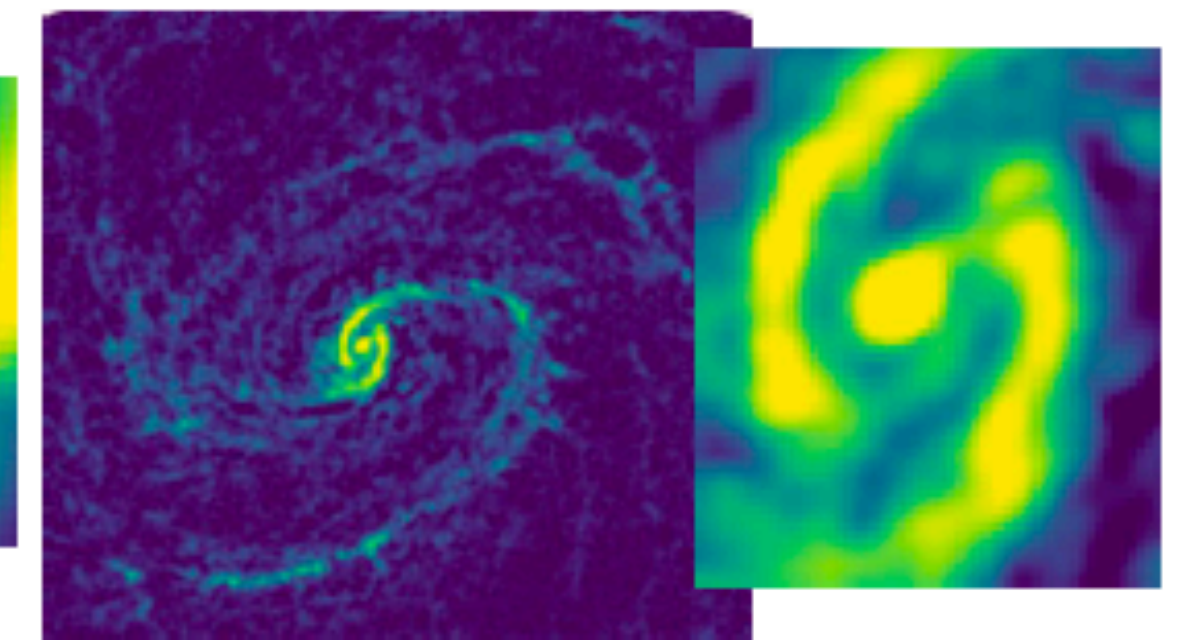
NGC1433



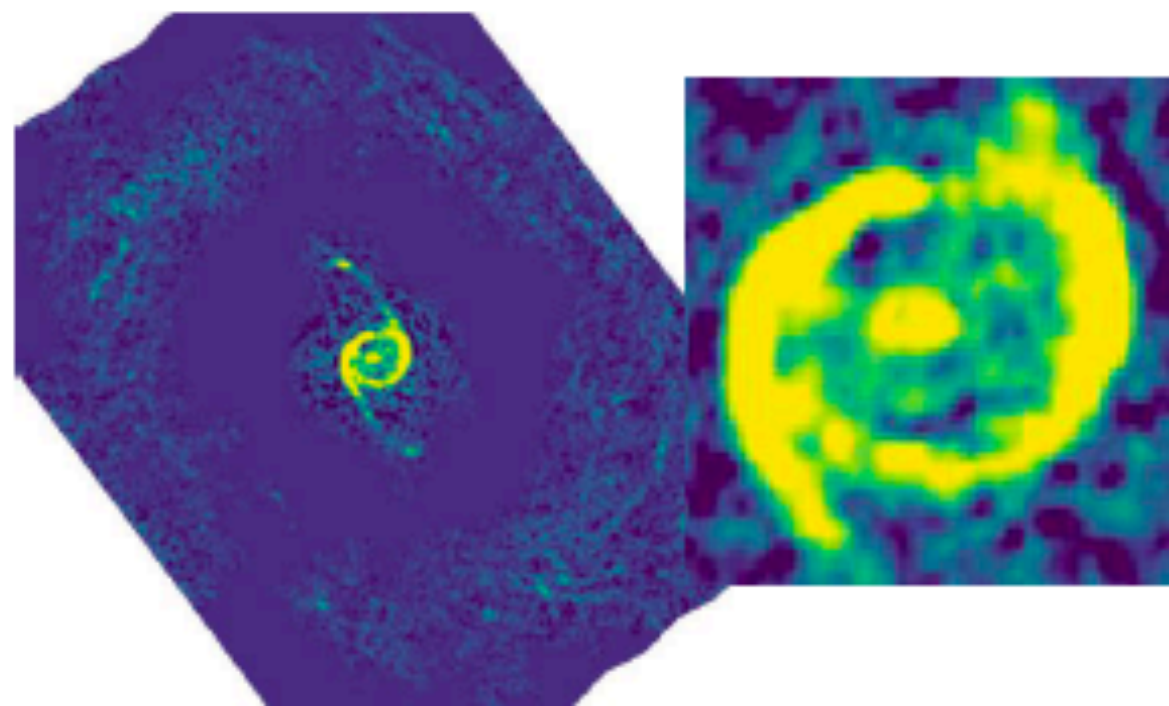
NGC4303



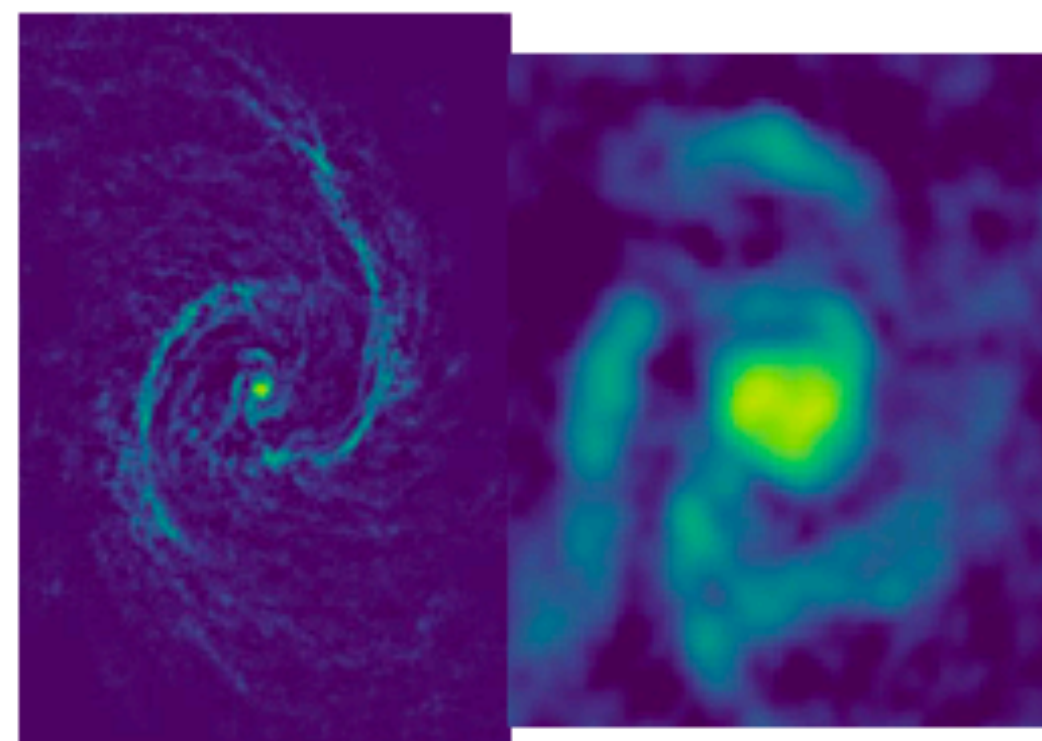
NGC4321



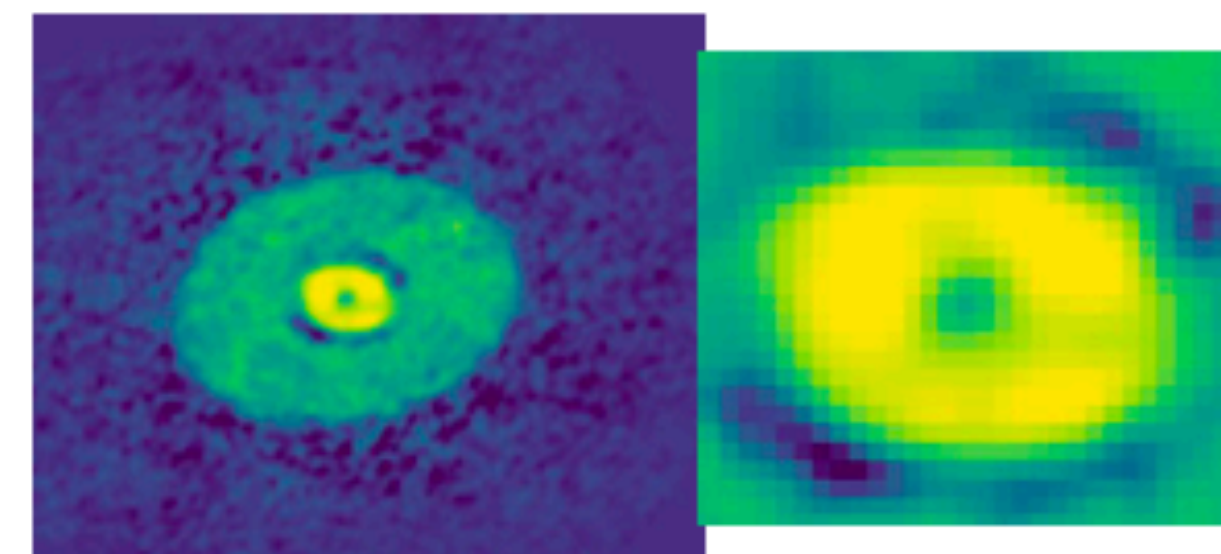
NGC1512



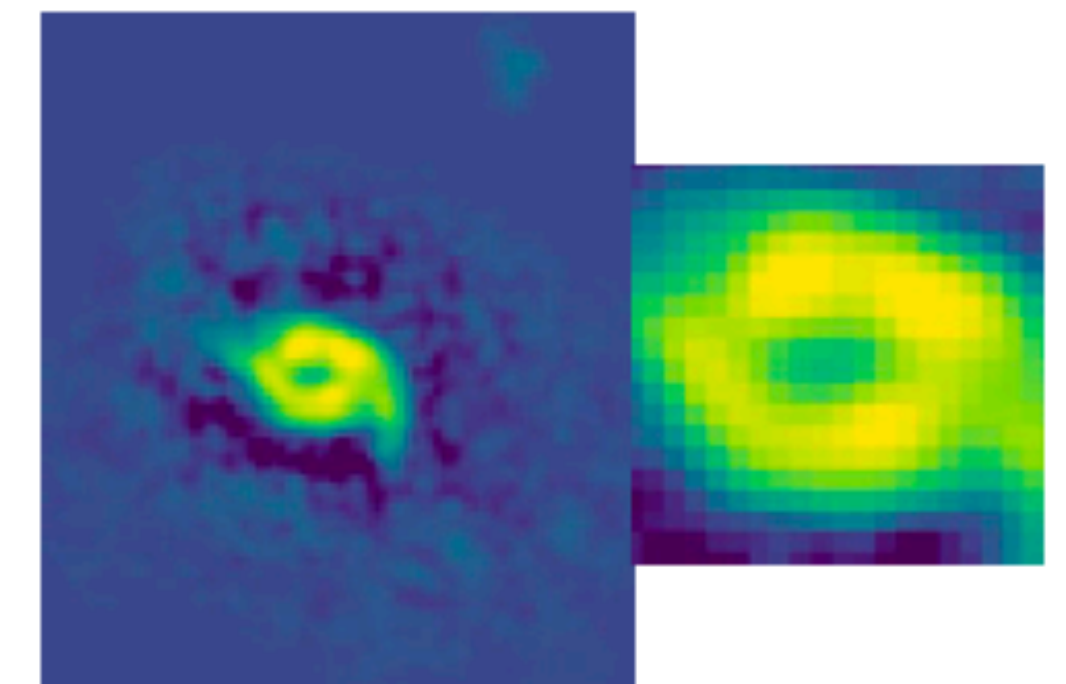
NGC1566



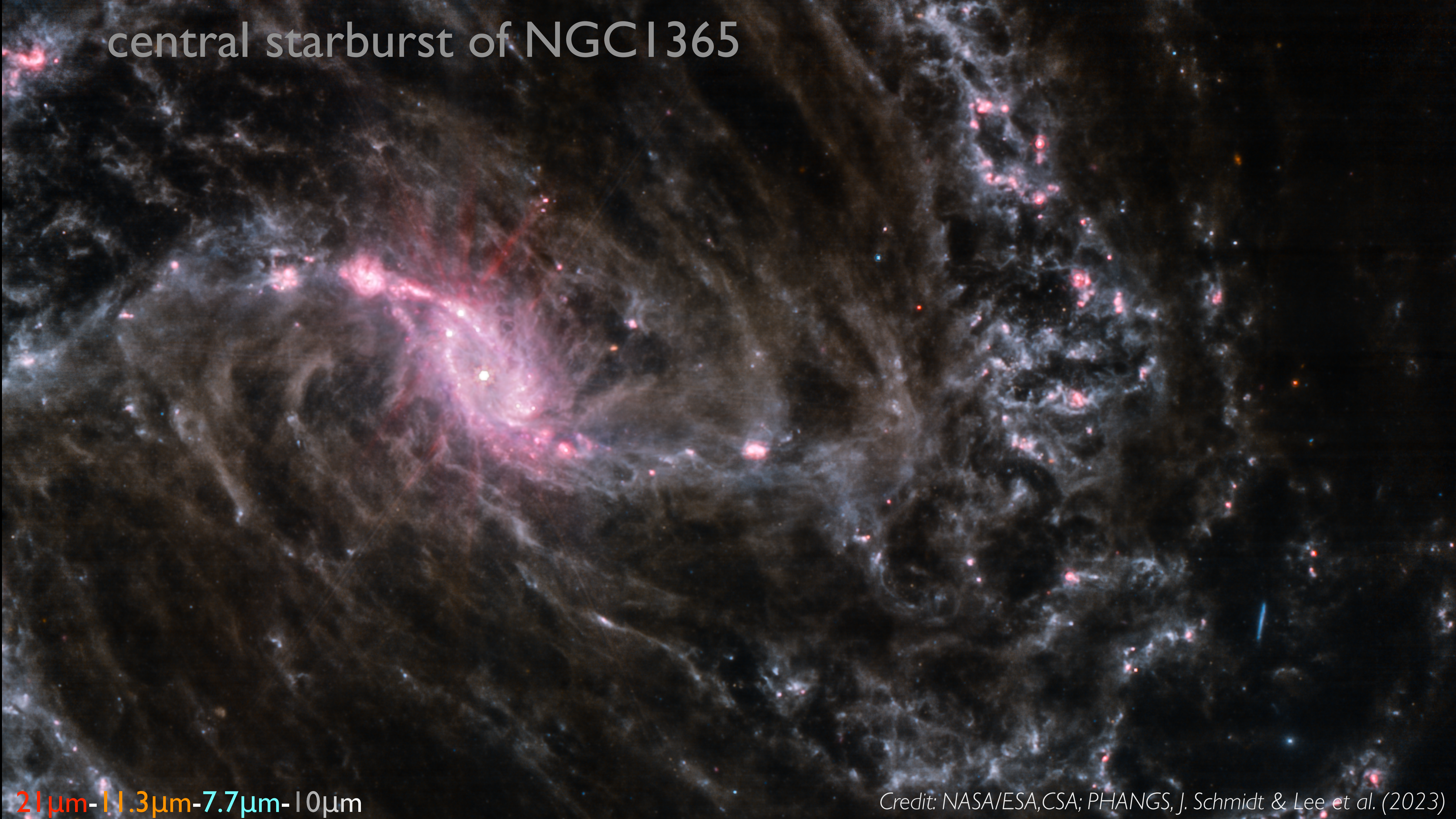
NGC4459



NGC4477



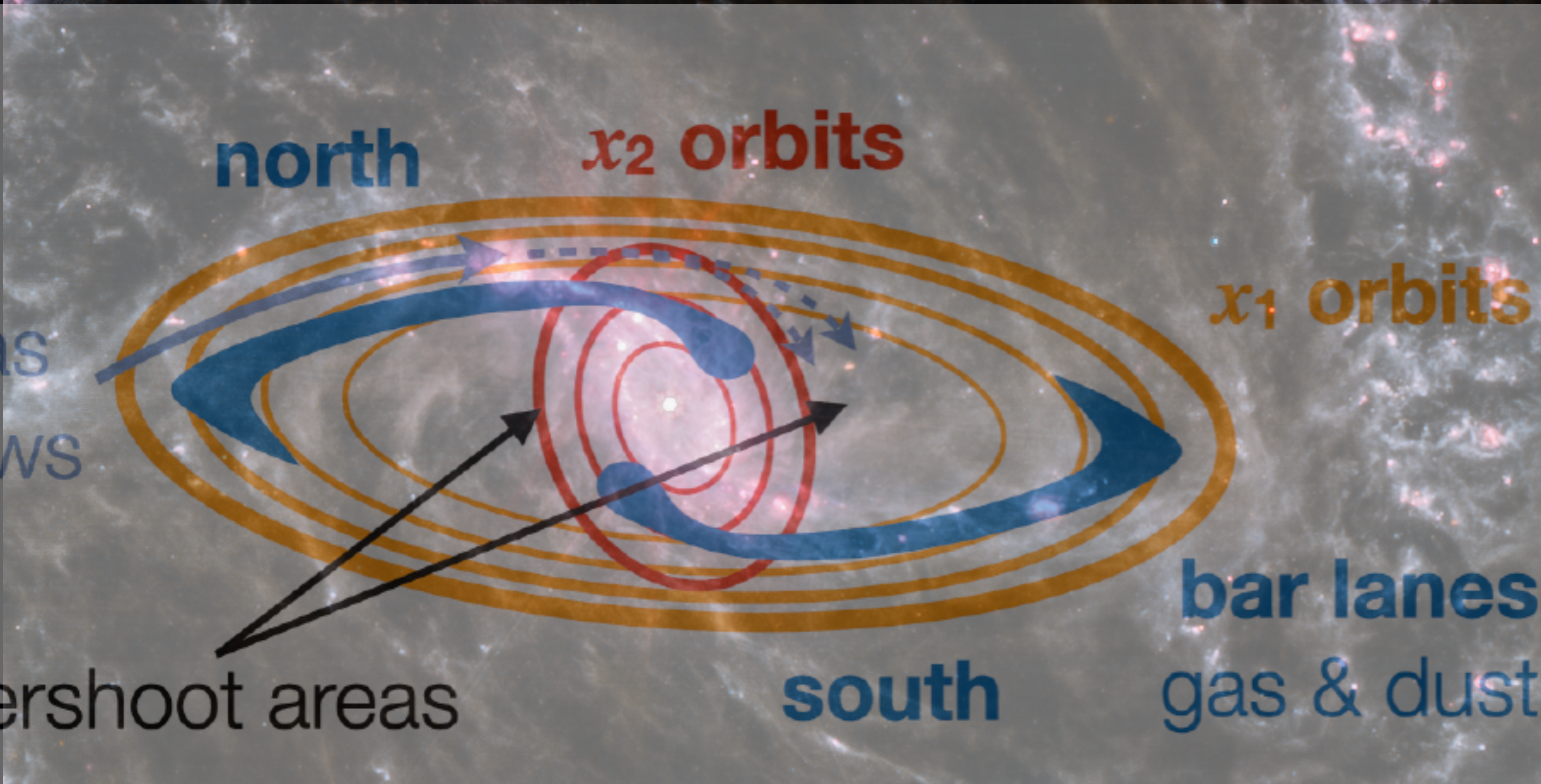
central starburst of NGC 1365



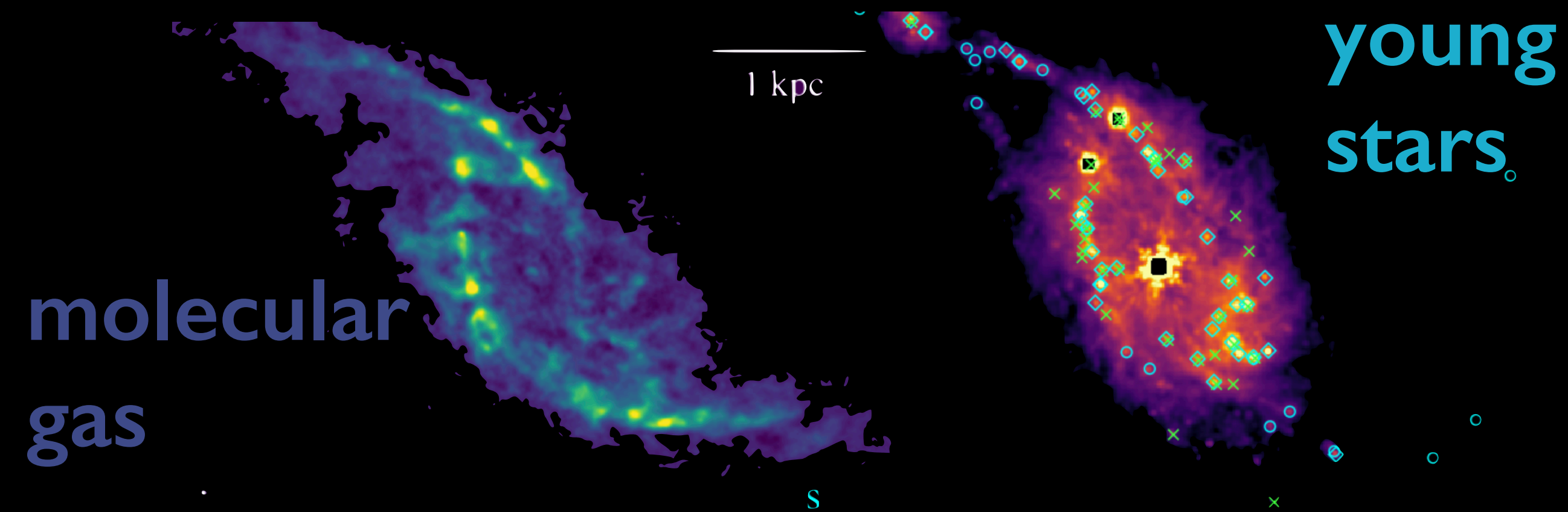
2.1 μm - 1.3 μm - 7.7 μm - 10 μm

Credit: NASA/ESA, CSA; PHANGS, J. Schmidt & Lee et al. (2023)

central starburst of NGC 1365



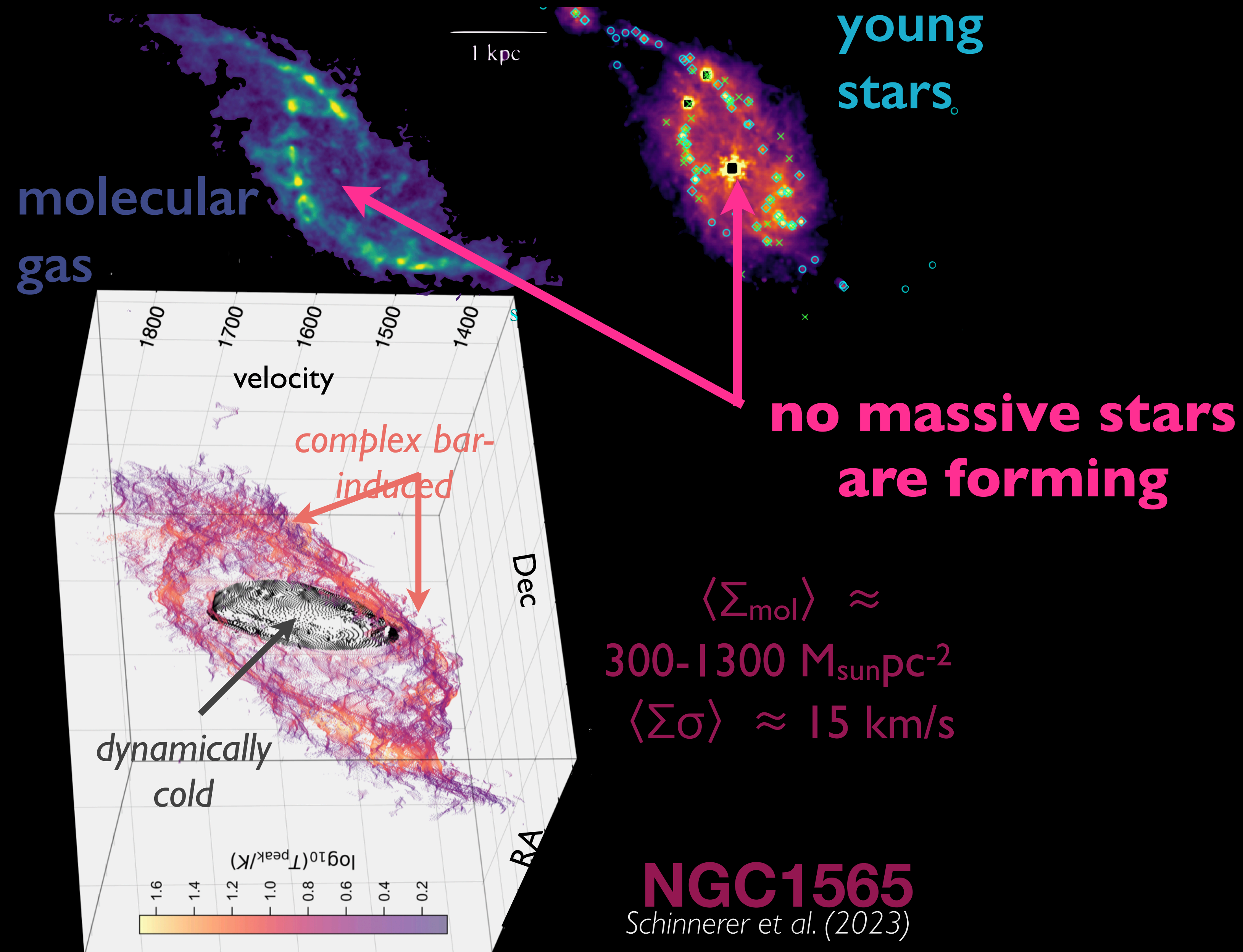
suppression of star formation inside star-forming rings



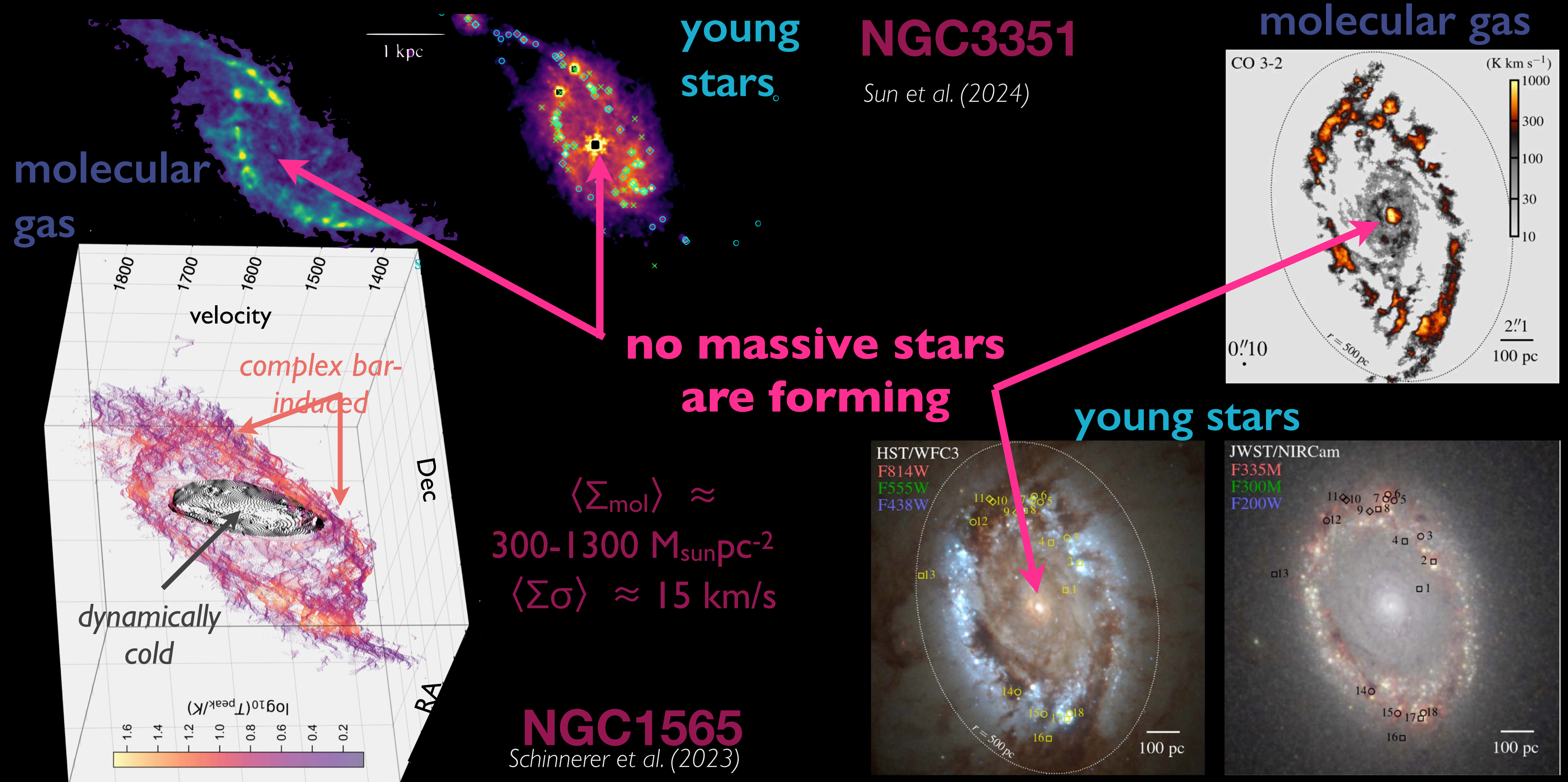
$$\langle \Sigma_{\text{mol}} \rangle \approx 300-1300 M_{\text{sun}} \text{pc}^{-2}$$
$$\langle \Sigma \sigma \rangle \approx 15 \text{ km/s}$$

NGC1565
Schinnerer et al. (2023)

suppression of star formation inside star-forming rings



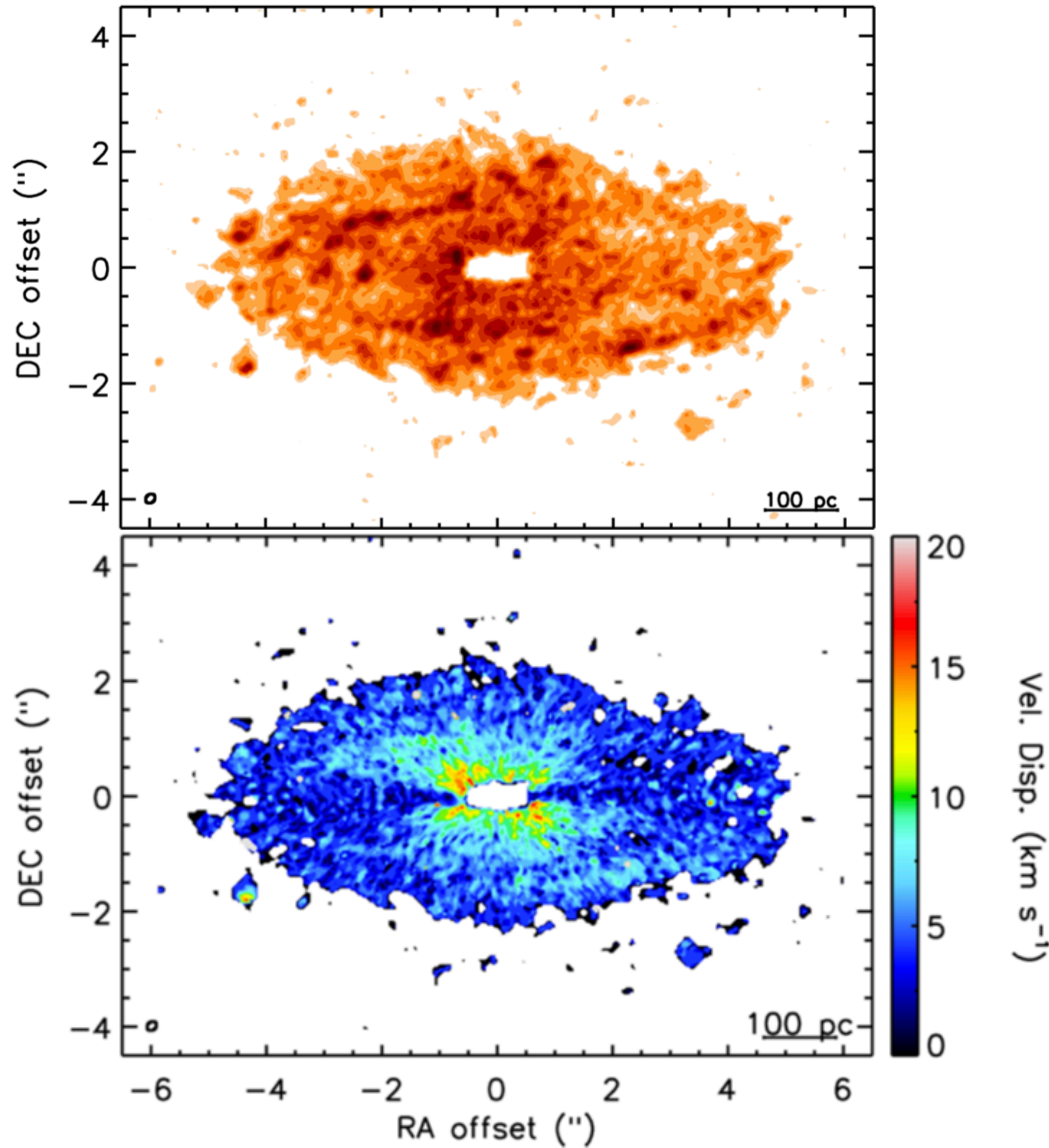
suppression of star formation inside star-forming rings



quiescent gas disk in an early-type galaxy from WISDOM

Davis et al. (2018), Liu et al. (2021), Lu et al. (2025)

NGC4426



central $\sim 700 \text{ pc}^2$
rotating gas disk

217 clouds @ $\sim 12 \text{ pc}$ resolution:

$$\langle \log (\Sigma_{\text{mol}} / M_{\text{sun}} \text{pc}^{-2}) \rangle \approx 2.3$$

$$\langle \Sigma \sigma \rangle \approx 5 \text{ km/s}$$

no massive star formation (*H α* , *BPT*)

$$\text{SFR} < 0.1 M_{\text{sun}} \text{yr}^{-1}$$

Why are no (high-mass) stars forming in some gas-rich centers?

suggestions for mechanisms inhibiting star formation:

- disk pressure stabilises against collapse
- tidal disruption of 'clouds'
- shearing of 'clouds', shear-induced turbulence

- higher gas density threshold (as proposed for MW CMZ)
- magnetic fields
- heating by cosmic rays, AGN ?
- ...

How can we test these?

central $10 \times 10 \text{ kpc}^2$
deprojected, i.e. face-on
 $7.7 \mu\text{m}$ PAH emission

(tracing both SF and cold neutral ISM, e.g., Leroy+23)

all barred galaxies
low to high stellar mass

