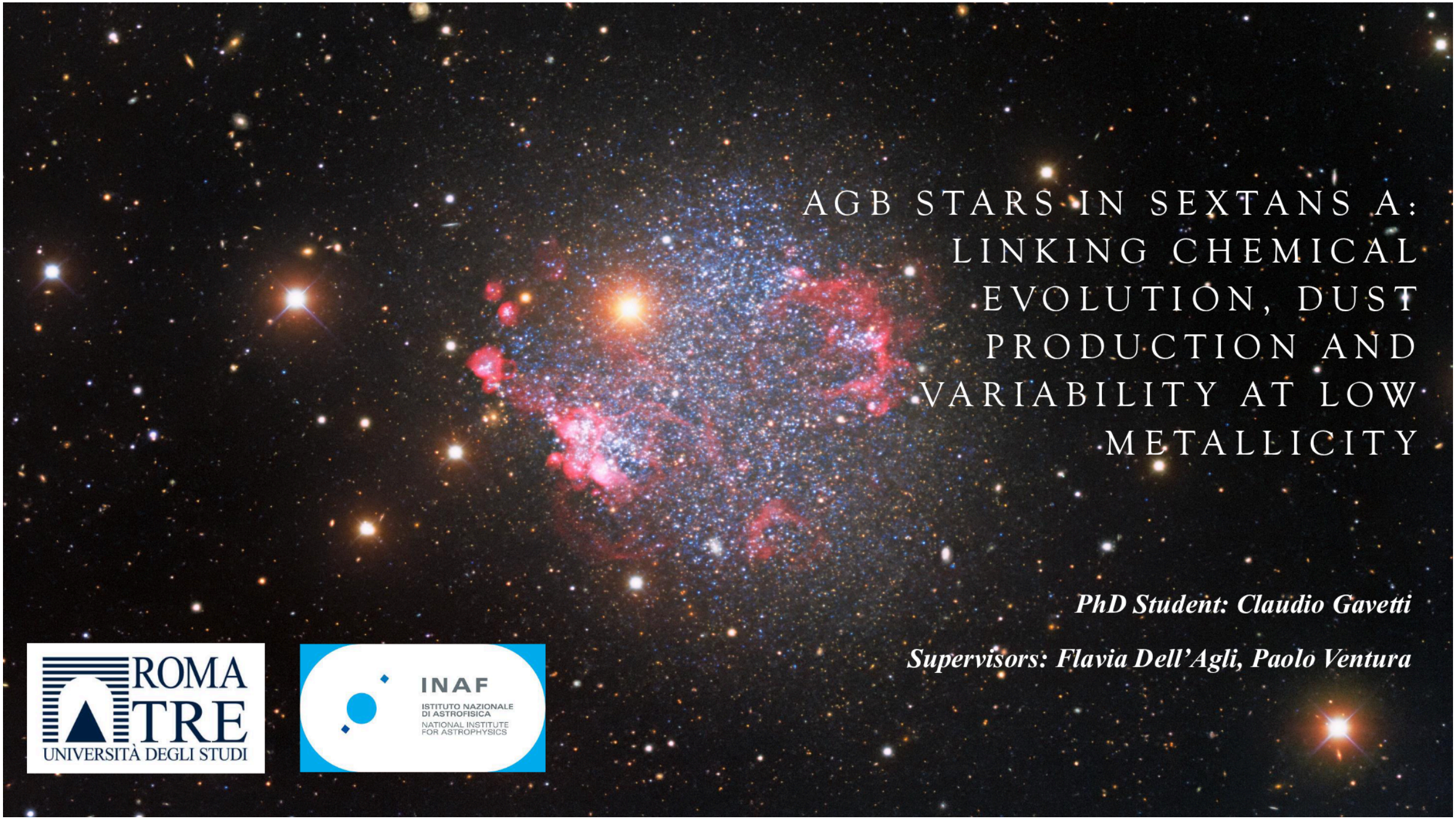


AGB STARS IN SEXTANS A: LINKING CHEMICAL EVOLUTION, DUST PRODUCTION AND VARIABILITY AT LOW METALLICITY

PhD Student: Claudio Gavetti

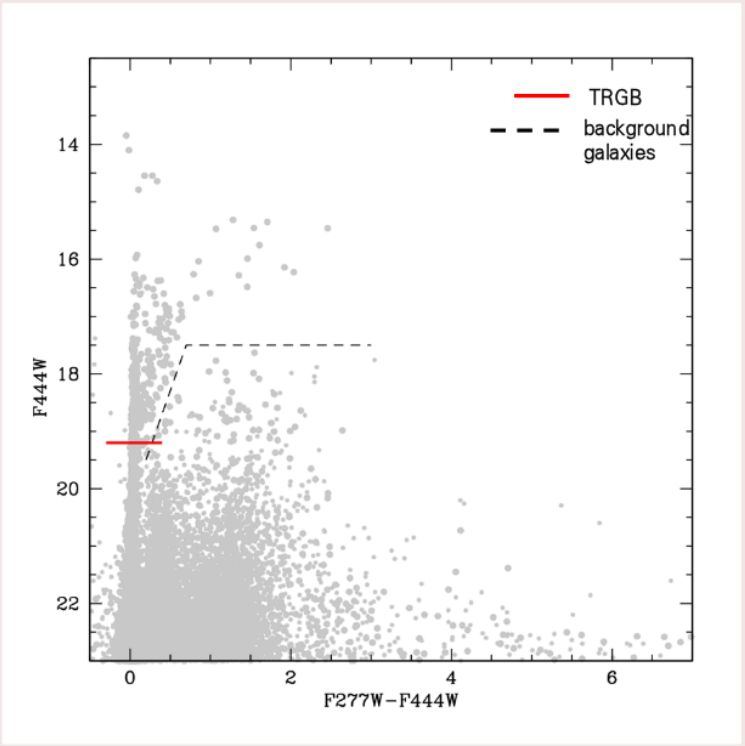
Supervisors: Flavia Dell'Agli, Paolo Ventura

ROMA TRE UNIVERSITÀ DEGLI STUDI

INAF ISTITUTO NAZIONALE DI ASTROFISICA NATIONAL INSTITUTE FOR ASTROPHYSICS

SEXTANS A





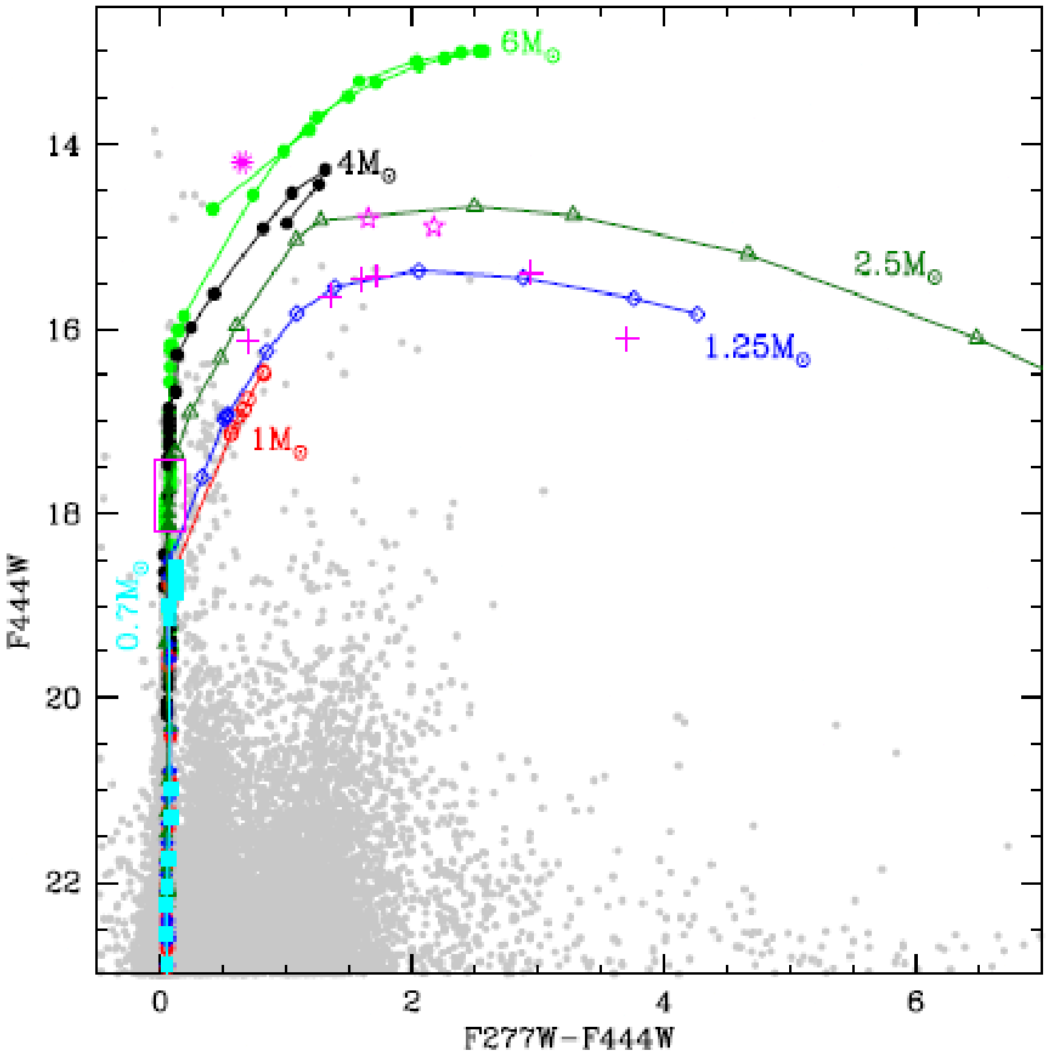
- ***Type:*** dwarf irregular
- ***Distance*** = 1.32 Mpc
- ***Diameter*** = 1.5 kpc
- ***Metallicity***: Z = (0.0004 ÷ 0.001)
- ***Data*****:** JWST (program 1619, PI M. Boyer)

241 AGB stars

- ***Statistical analisys***: determination of mass and formation epoch.
- ***Dust production analysis:*** determination of DPR.
- Effects of ***variability*** on the models.

Gavetti et al. (2025),
ApJ, 1006, 131

AGB POPULATION



★ low-mass stars ⟶ never reach the C-star stage, as they lose the envelope before the surface C/O > 1

$\lesssim 0.8M_{\odot}$

★★★ intermediate mass stars ⟶ become C-stars after experiencing a series of TPs and of TDU episodes, after which the surface C/O > 1

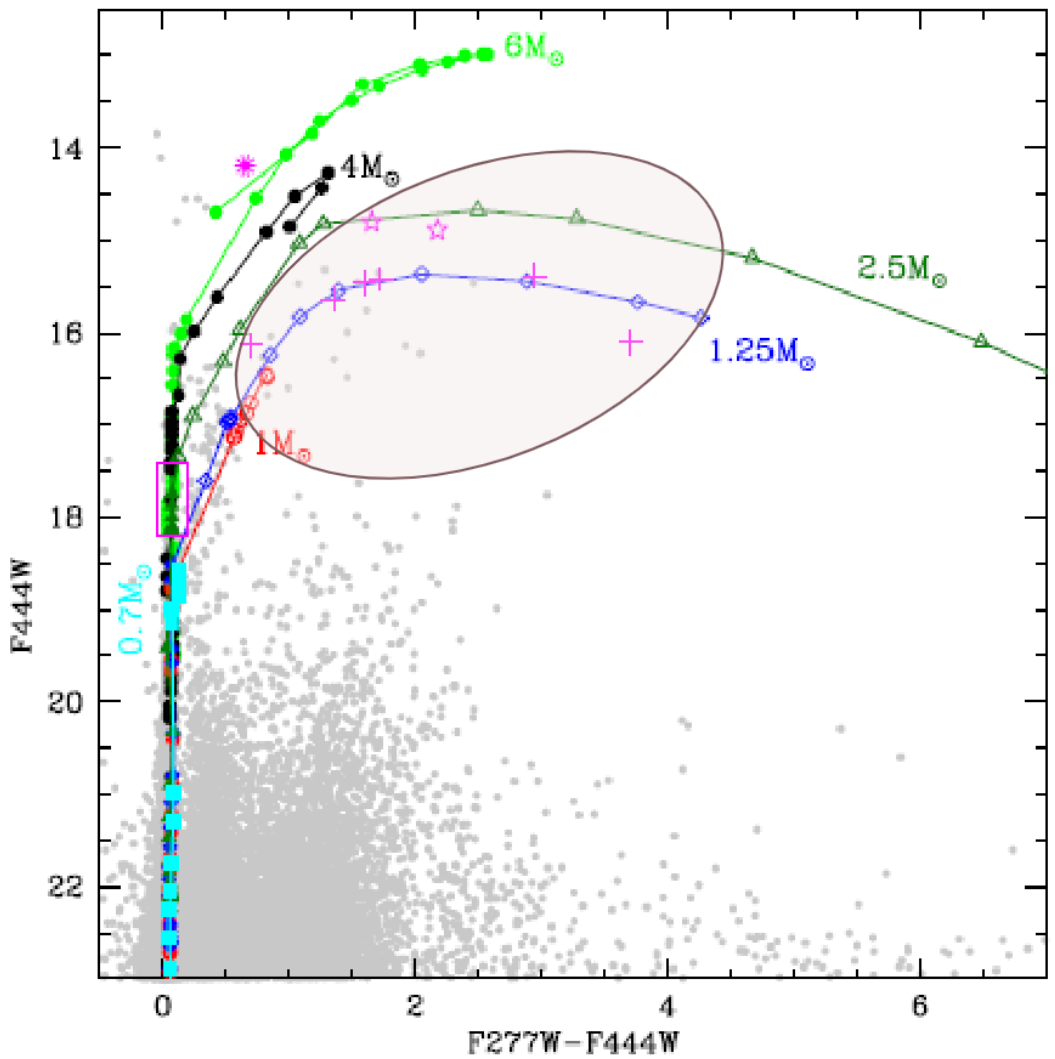
$\lesssim 3.5M_{\odot}$

★★ massive stars ⟶ undergo the ignition of HBB process, which prevents them from becoming carbon stars

intermediate C-stars
massive C-stars
HBB star

Stellar variability ($\pm$0.25 mag in F444W) may explain discrepancies between observed sources and evolutionary tracks.

DUST PRODUCTION RATE



- DPR in Sextans A is dominated by C-stars, descend from 1-3 $M_\odot$ progenitors formed 0.5 - 7 Gyrs ago.
- Low-mass O-rich AGB stars contribute is negligible due to the galaxy's low metallicity.
- $\frac{\dot{M}}{10^{-8} M_\odot yr^{-1}} = (F277W - F444W)^{1.7}$

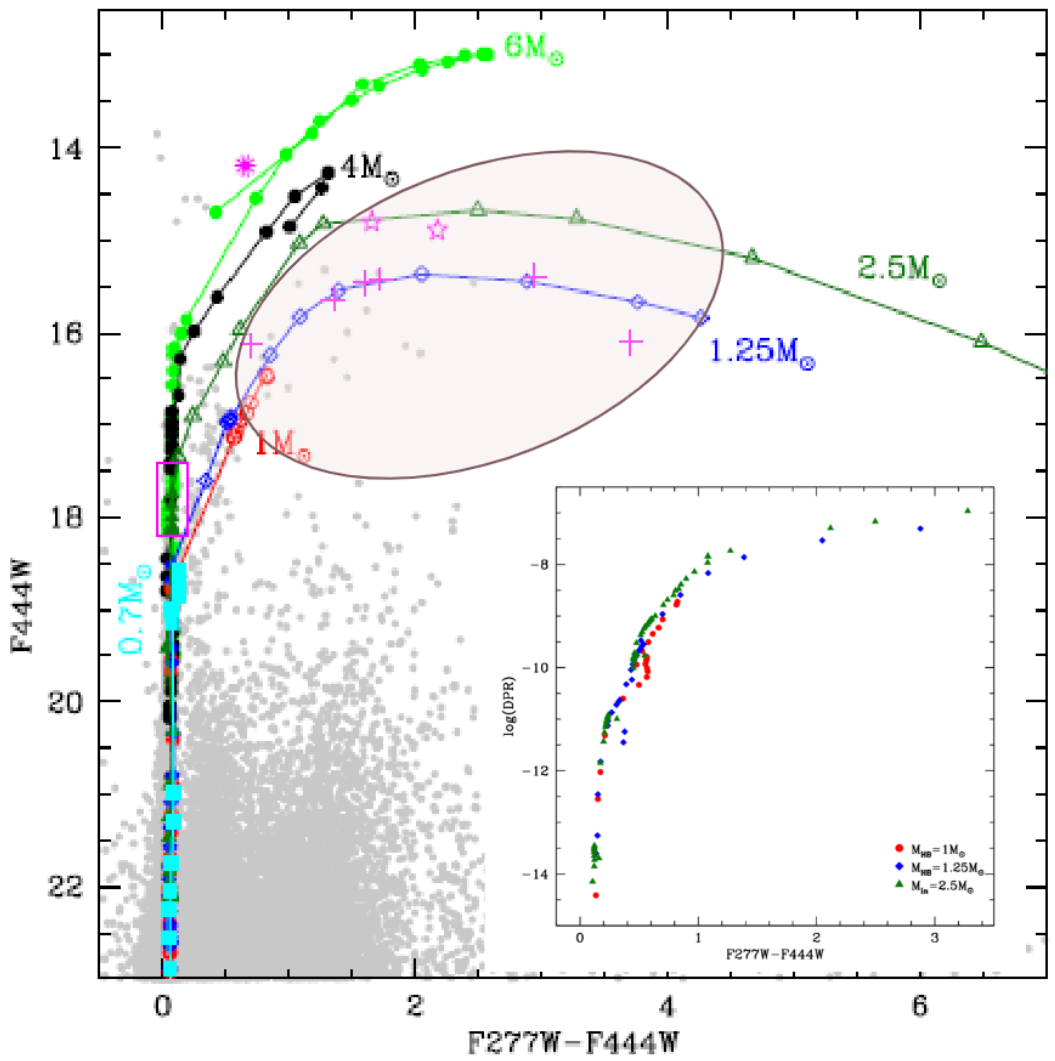
DPR

$\dot{M}_{Car} = 5 \times 10^{-7}\ M_\odot/yr$ $\dot{M}_{Sil} < 10^{-10}\ M_\odot/yr$

Dust productions depends on pulsation velocity. In models, $v_{out} = 1 - 5\ km/s$.

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CONCLUSIONS

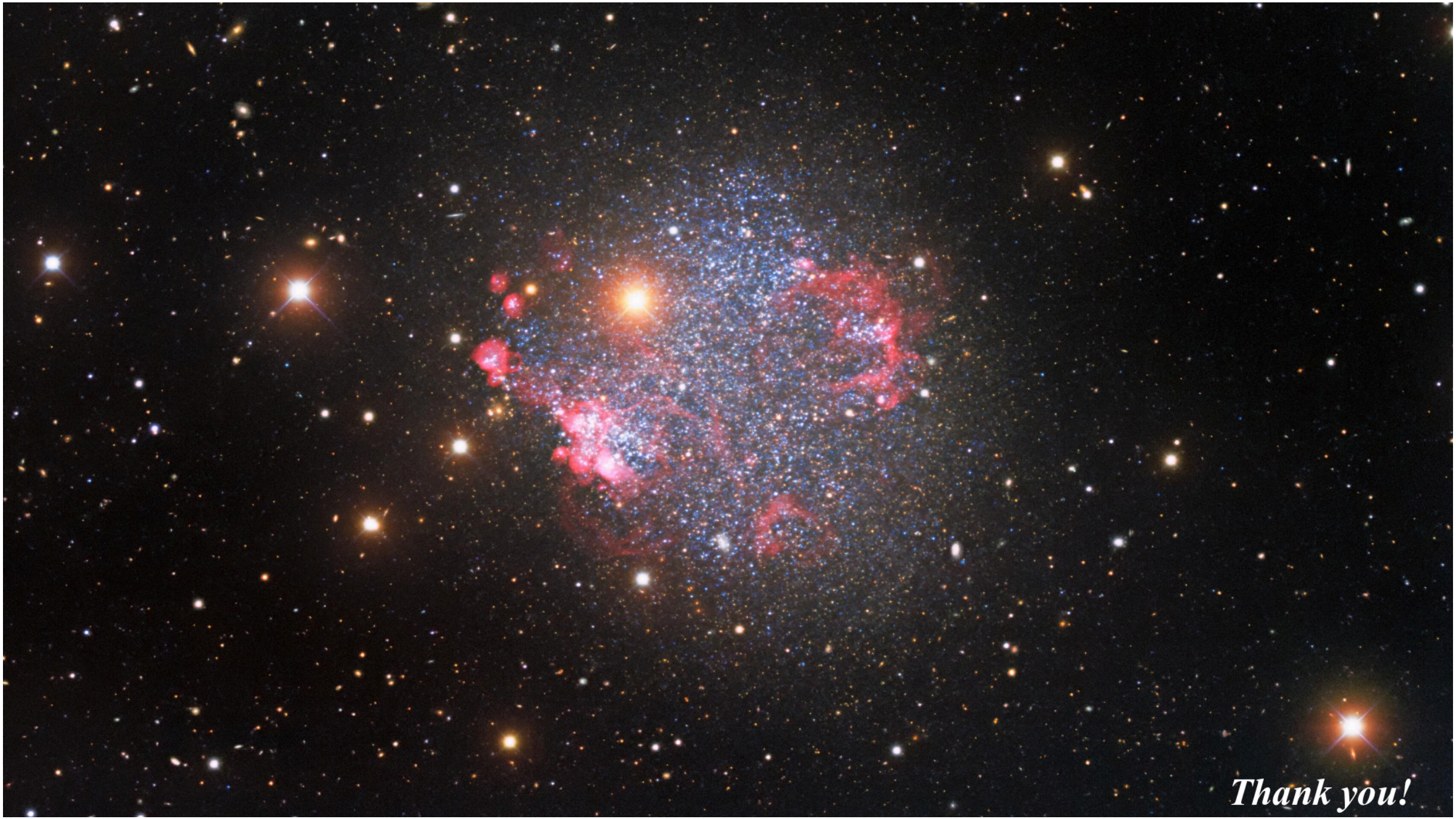
• The **AGB population of Sextans A is dominated by dust-free, mostly M-type stars**, forming a nearly vertical sequence in the NIRCam CMD.

• The **dusty AGB population is mainly composed of carbon stars**, descended from progenitors with initial masses of approximately **1–3 $M_\odot$** and formation epochs between **0.5 and 7 Gyr ago**.

• **Carbon stars dominate the total AGB dust production**, while the contribution from oxygen-rich and massive AGB stars is expected to be negligible at the low metallicity of Sextans A.

• The total dust production rate is **slightly below 5×10^{-7} $M_\odot$ yr^{-1}**, with dust composed predominantly of **amorphous carbon** and less than **5% SiC**.

• **Stellar variability must be included in future model predictions**, as it affects both the observed photometry and dust formation; the current DPR estimates should therefore be interpreted as **mean values**.


Thank you!