

The End of Imposter Syndrome: **JWST observations of SN 1997bs**

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CCAPP Fellow, OSU

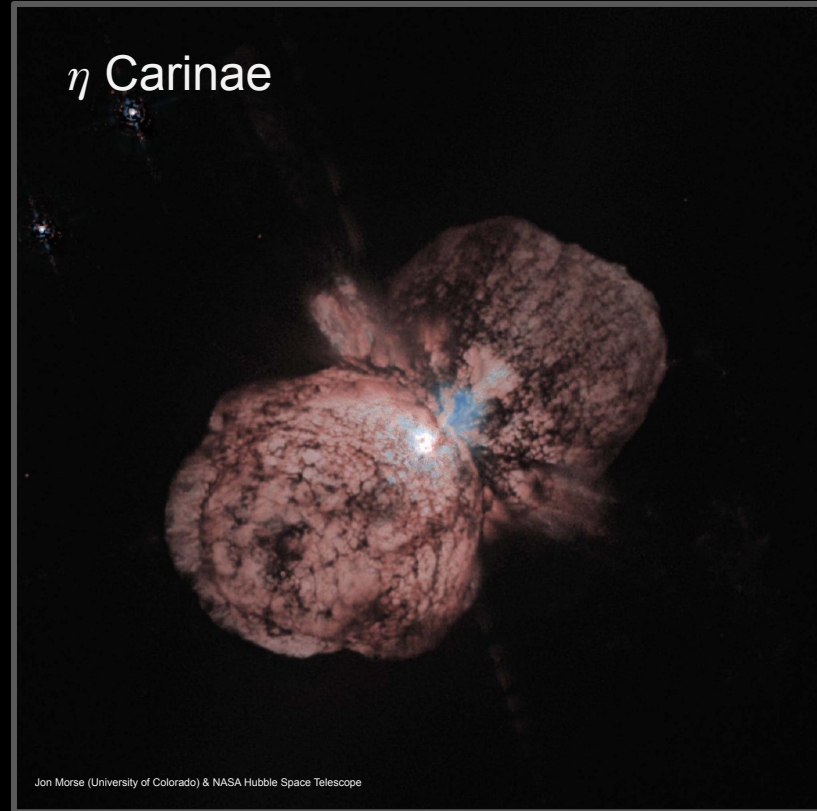


Collaborators: C Kochanek, A Leroy, M Rizzo-Smith + PHANGS

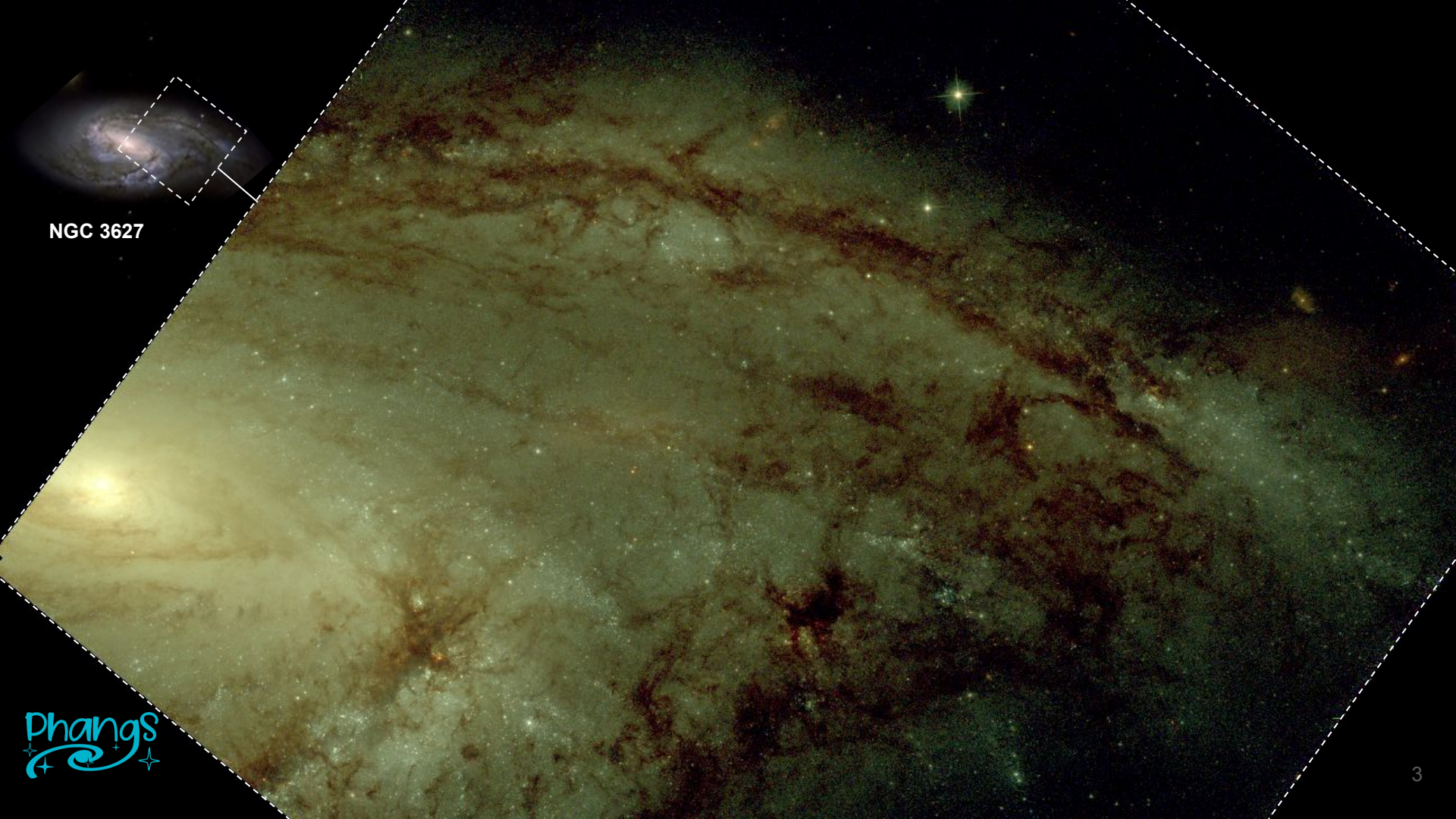
“Imposter” ?



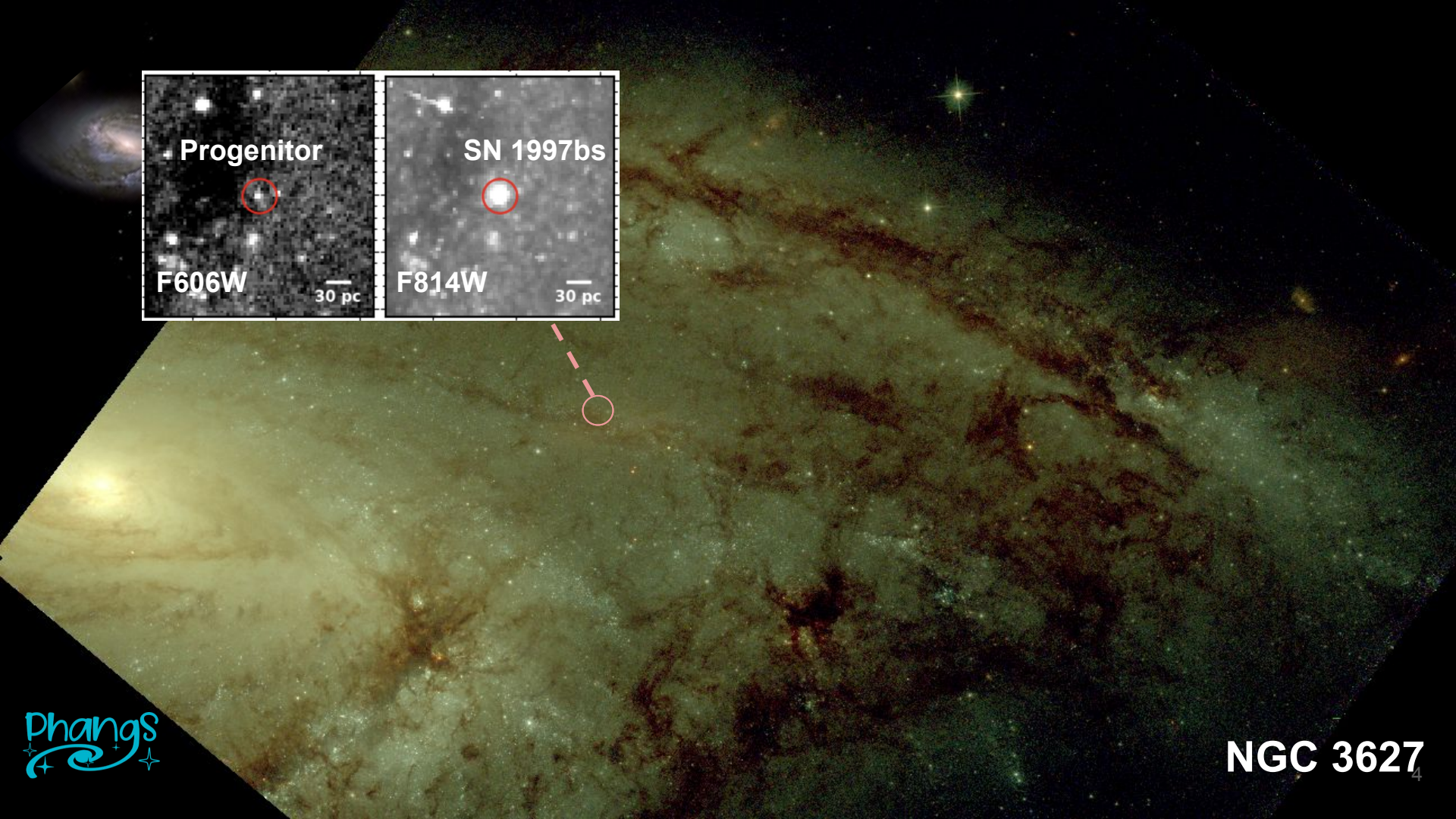
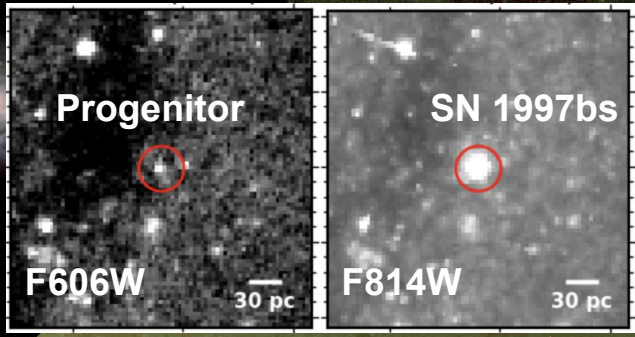
- Non-terminal, i.e. progenitor survives.
- E.g. η -Car, LBV/S-Dor outbursts
- Well known examples -- 1961V, 2009ip, etc.
- Heterogenous class
- Insight into evolution of most massive stars

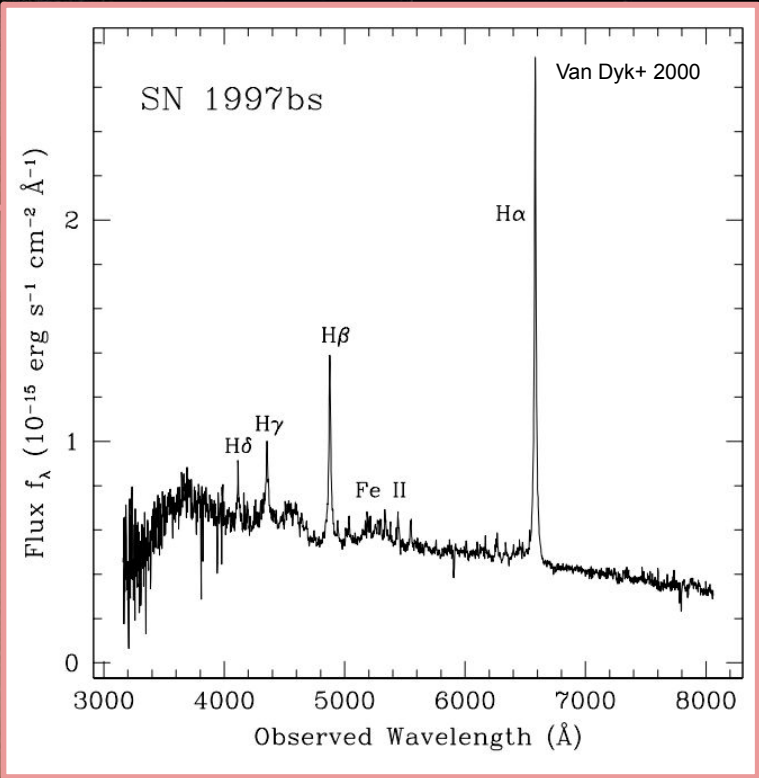
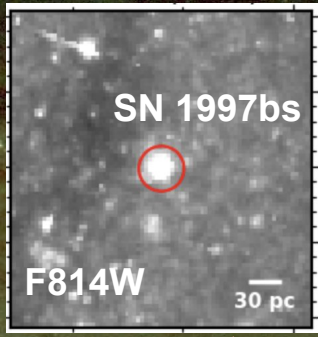
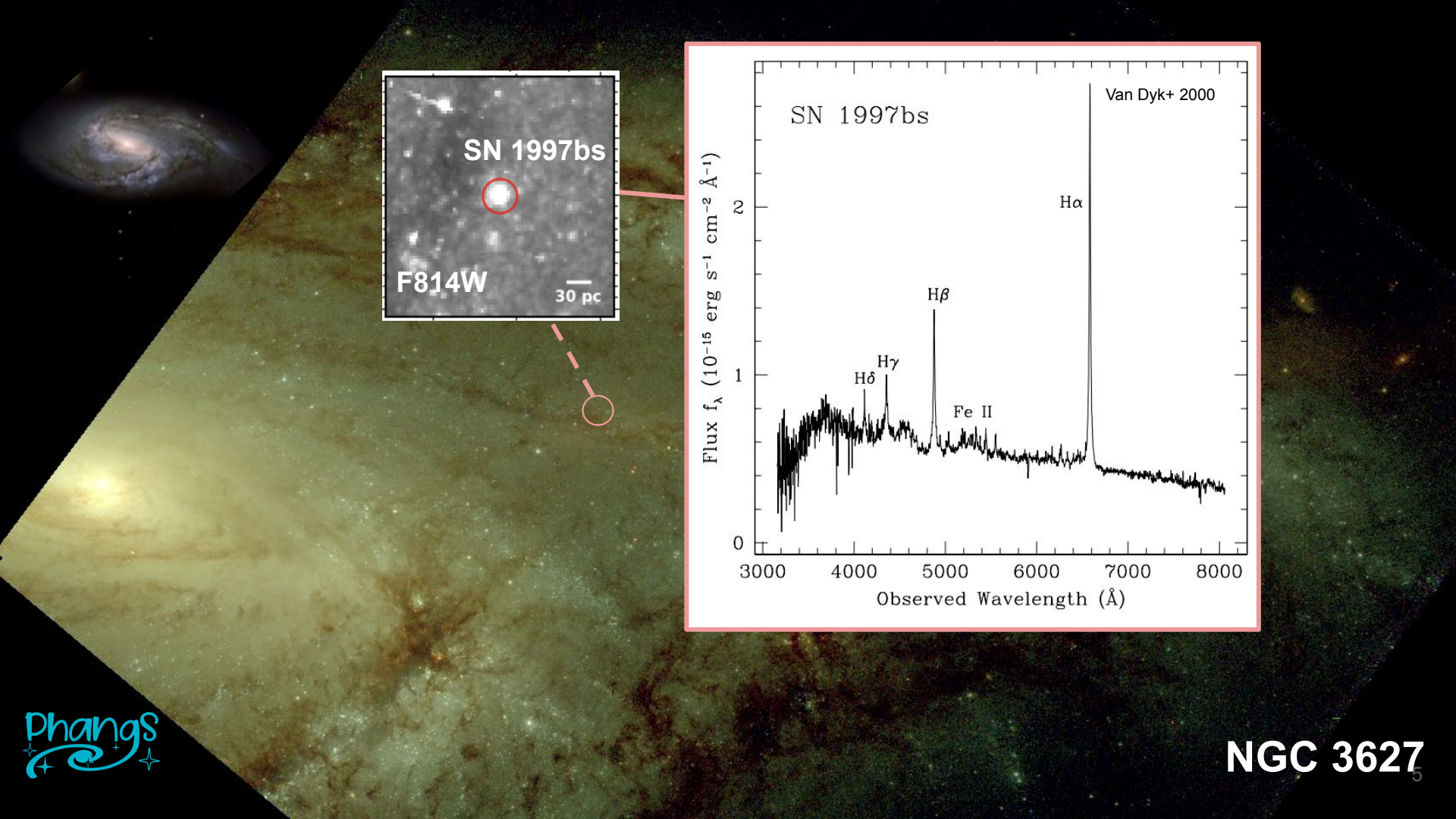


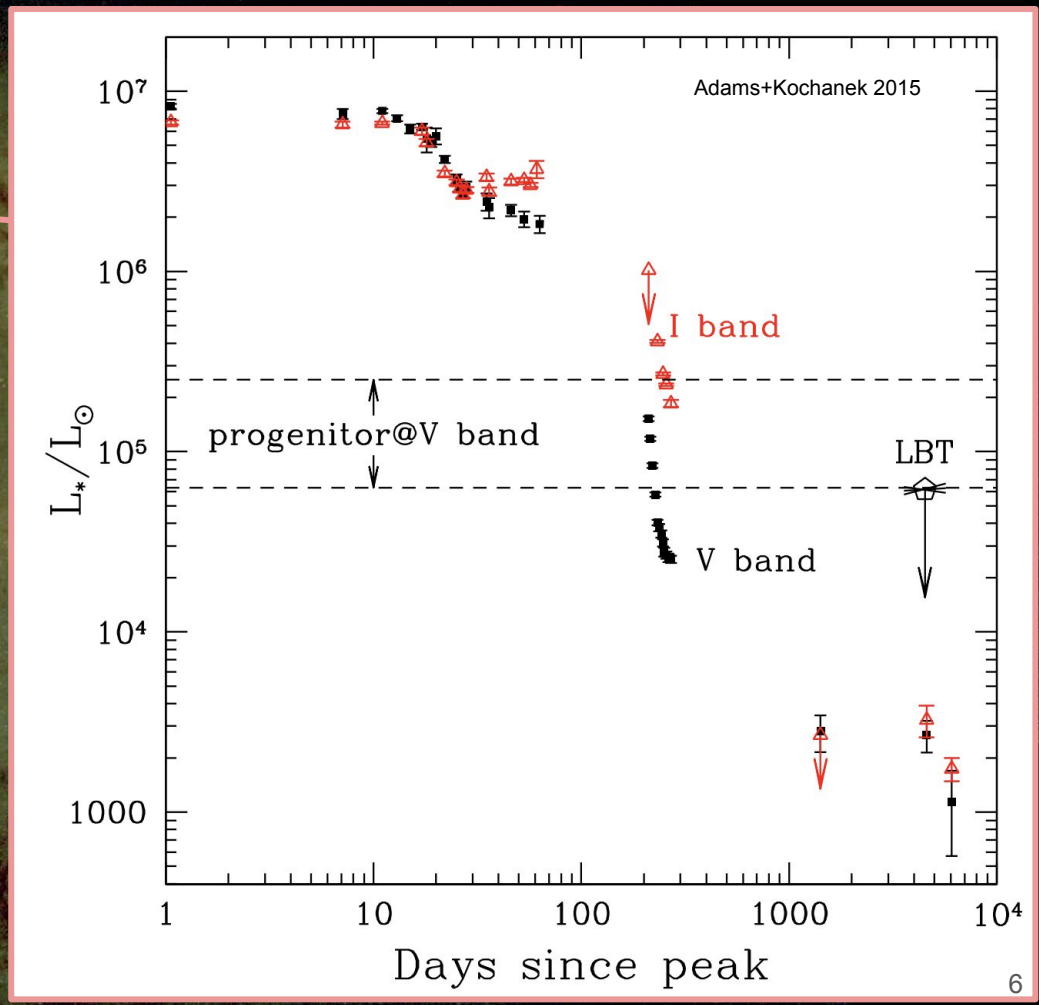
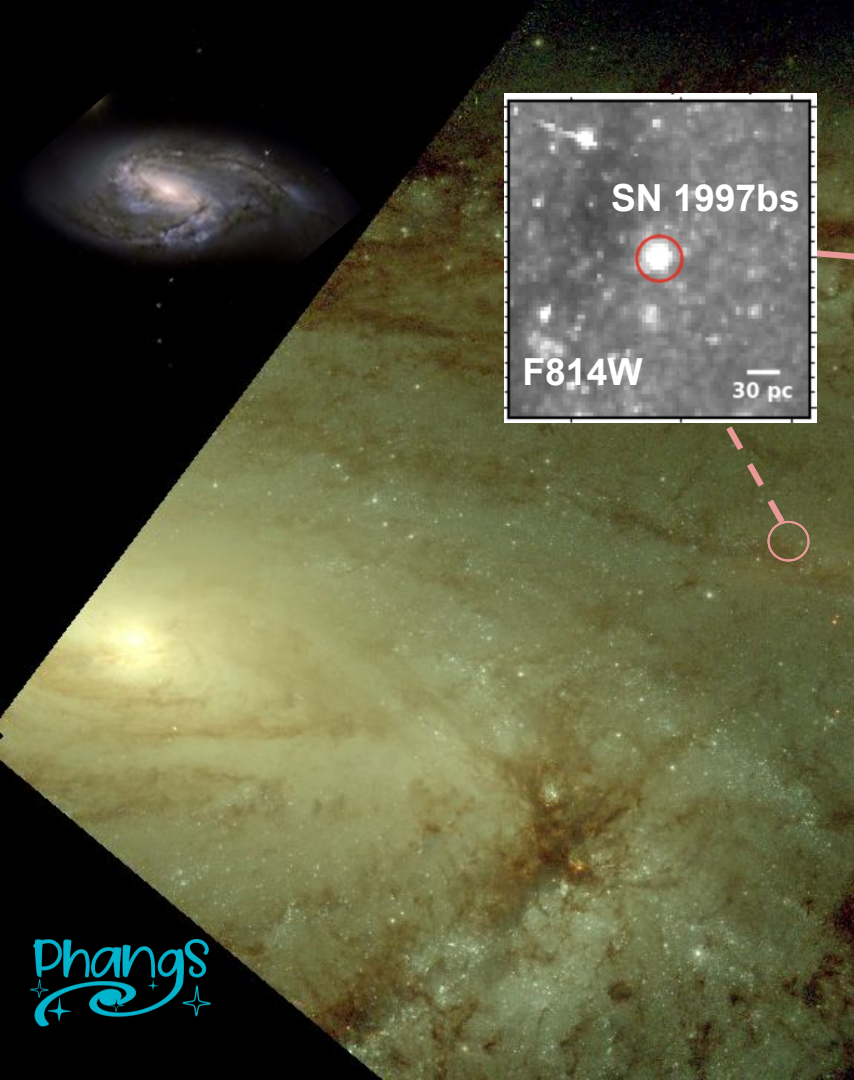
Jon Morse (University of Colorado) & NASA Hubble Space Telescope



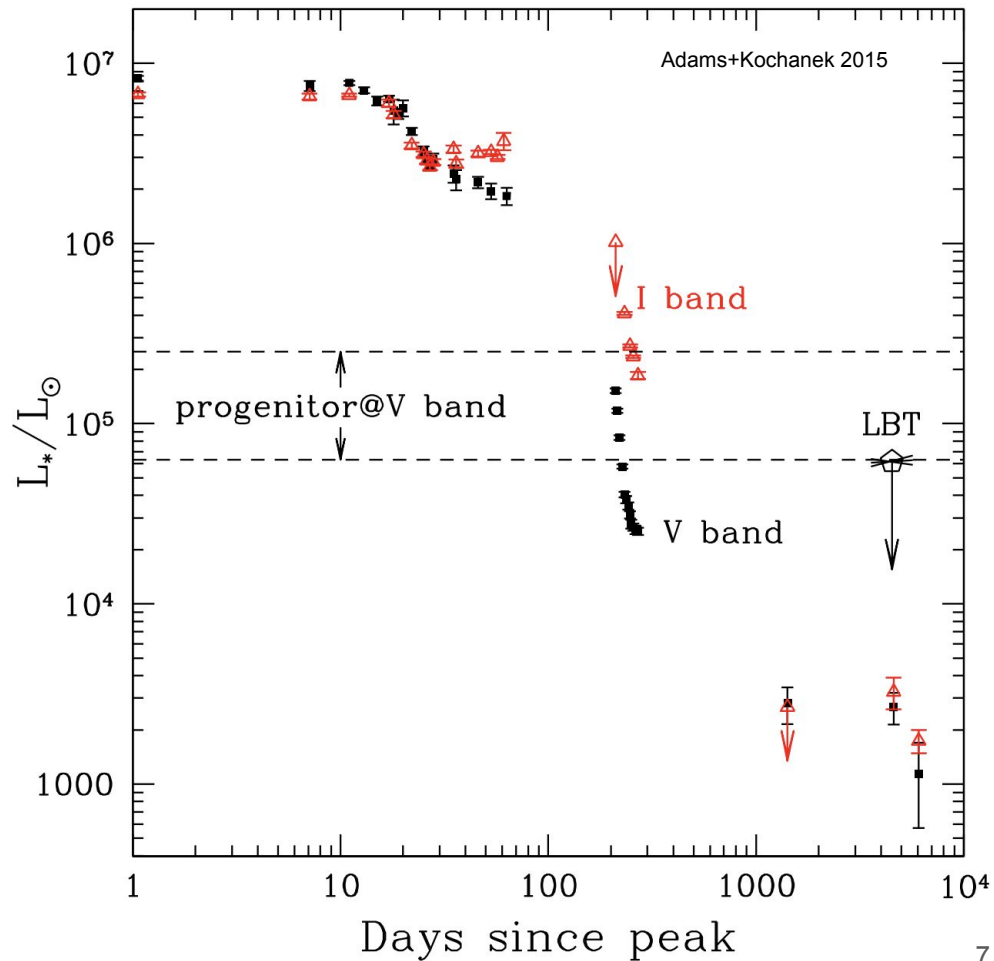
NGC 3627







Did 1997bs explode?

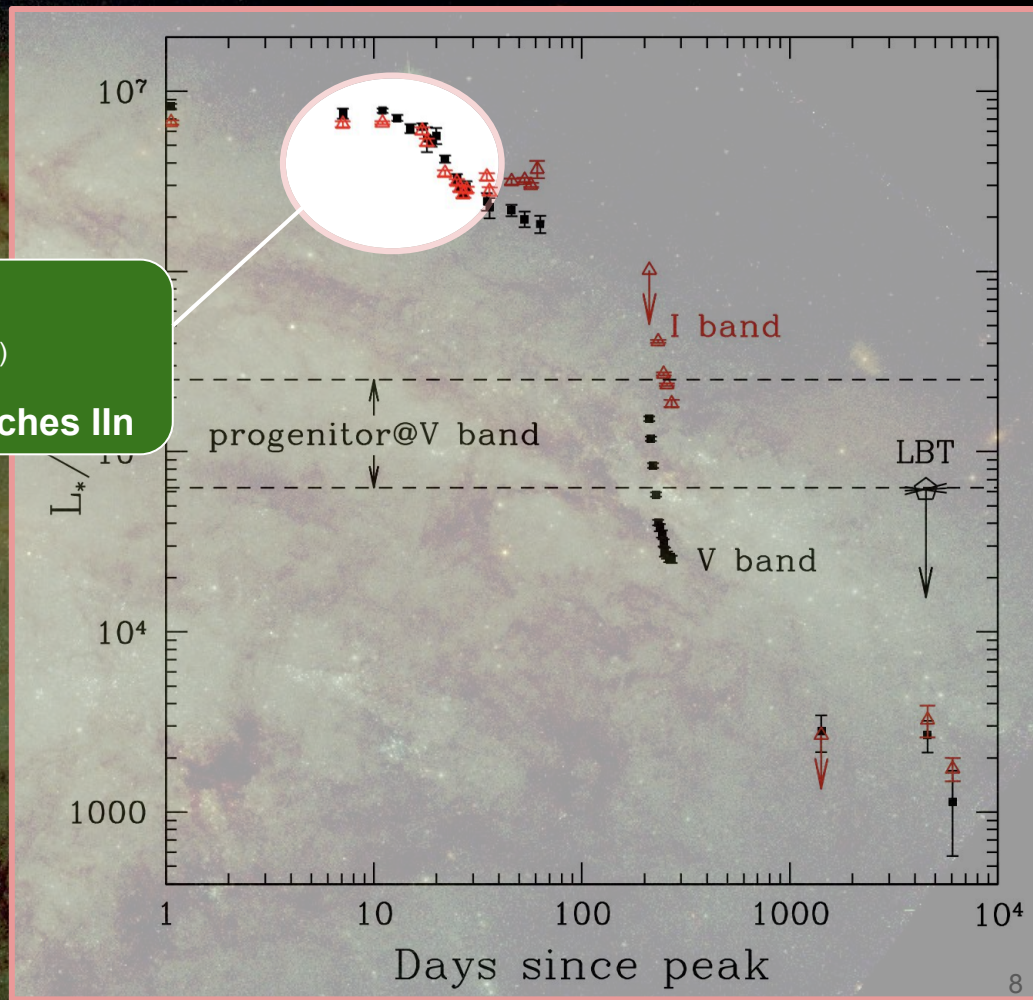


Did 1997bs explode?

YES

(Van Dyk 1999)

- Spectra matches II_n

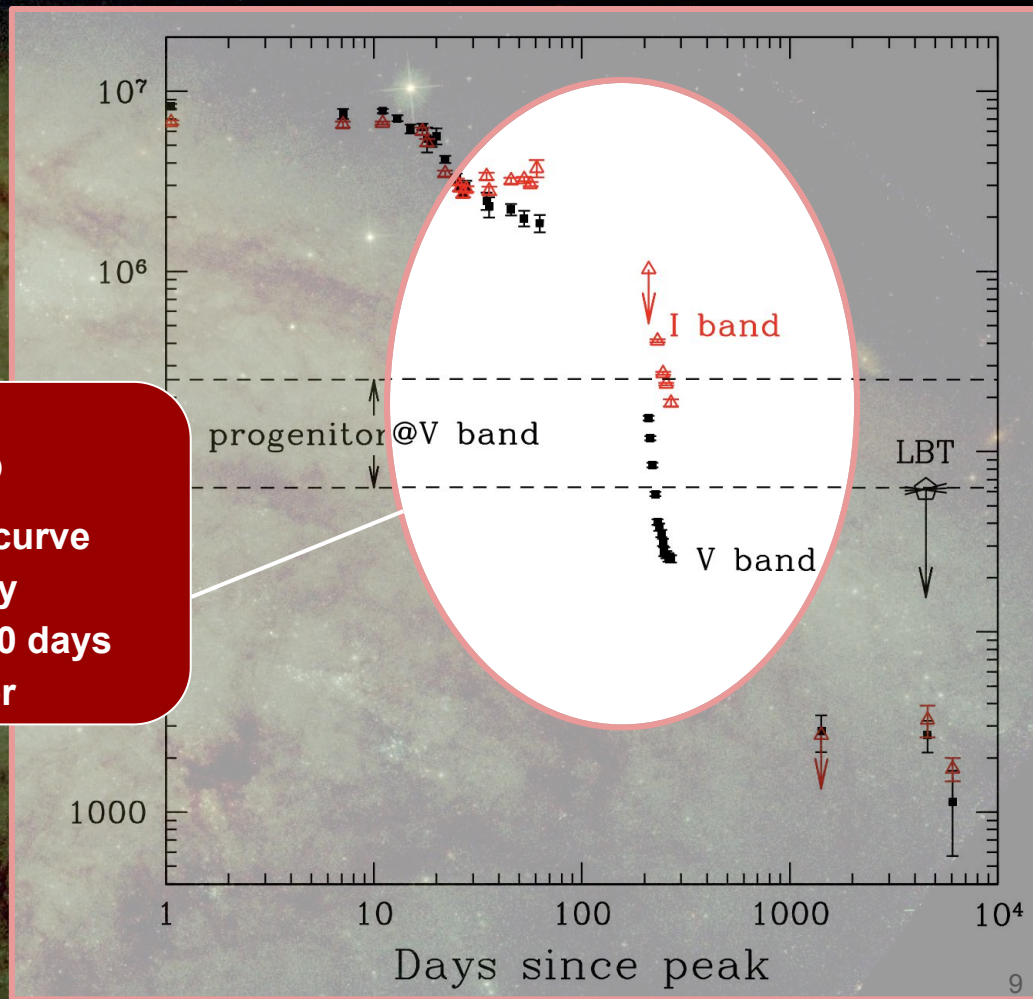


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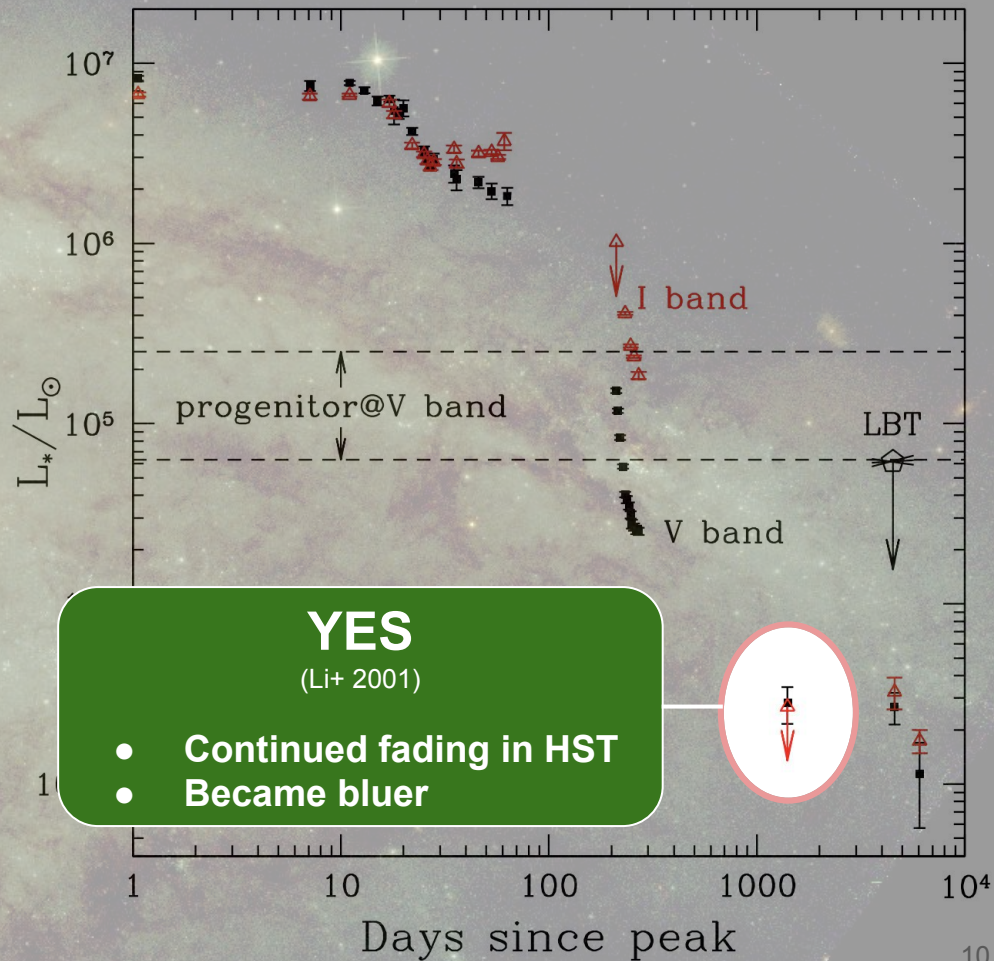
NO

(Van Dyk+ 2000)

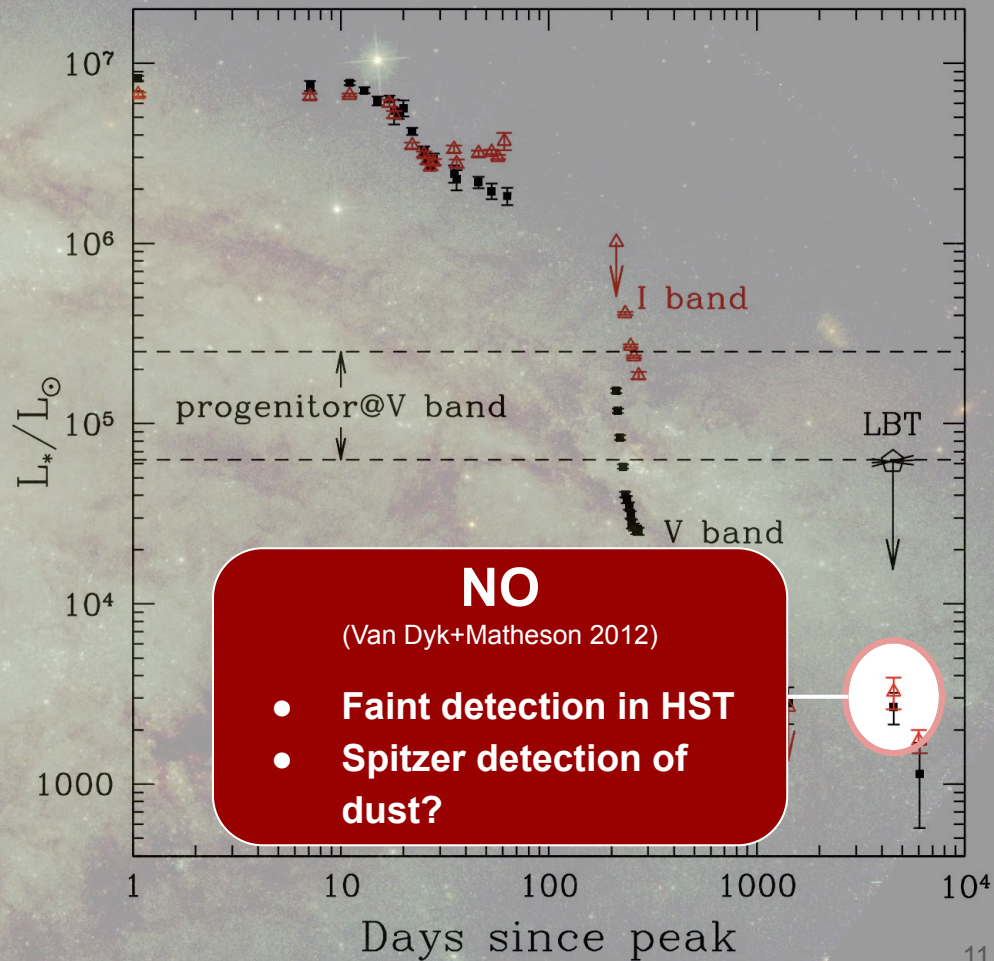
- Peculiar light curve
- Low luminosity
- Plateau at ~250 days
- Became redder



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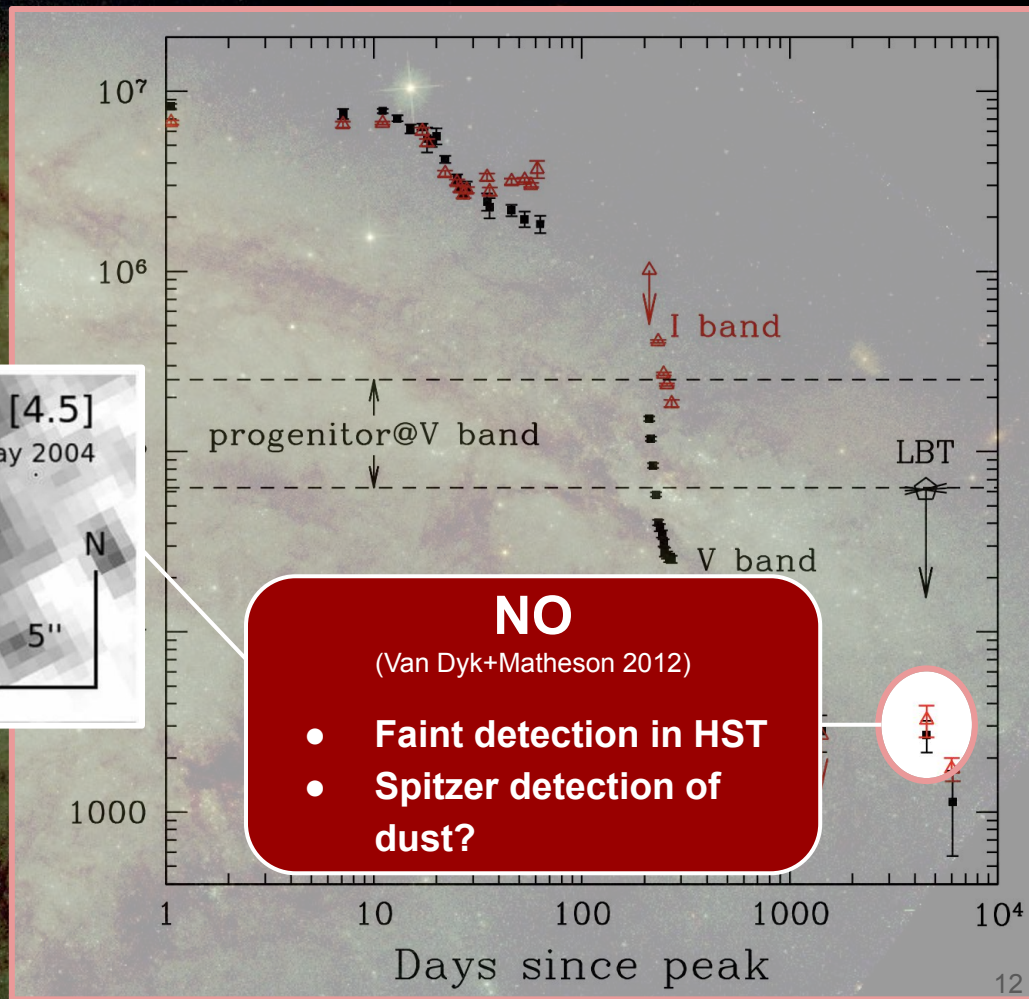
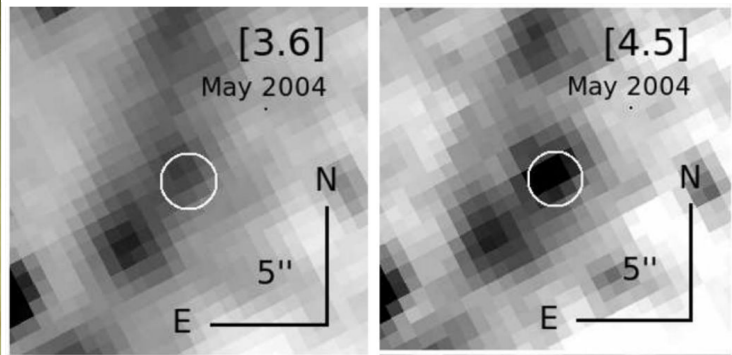


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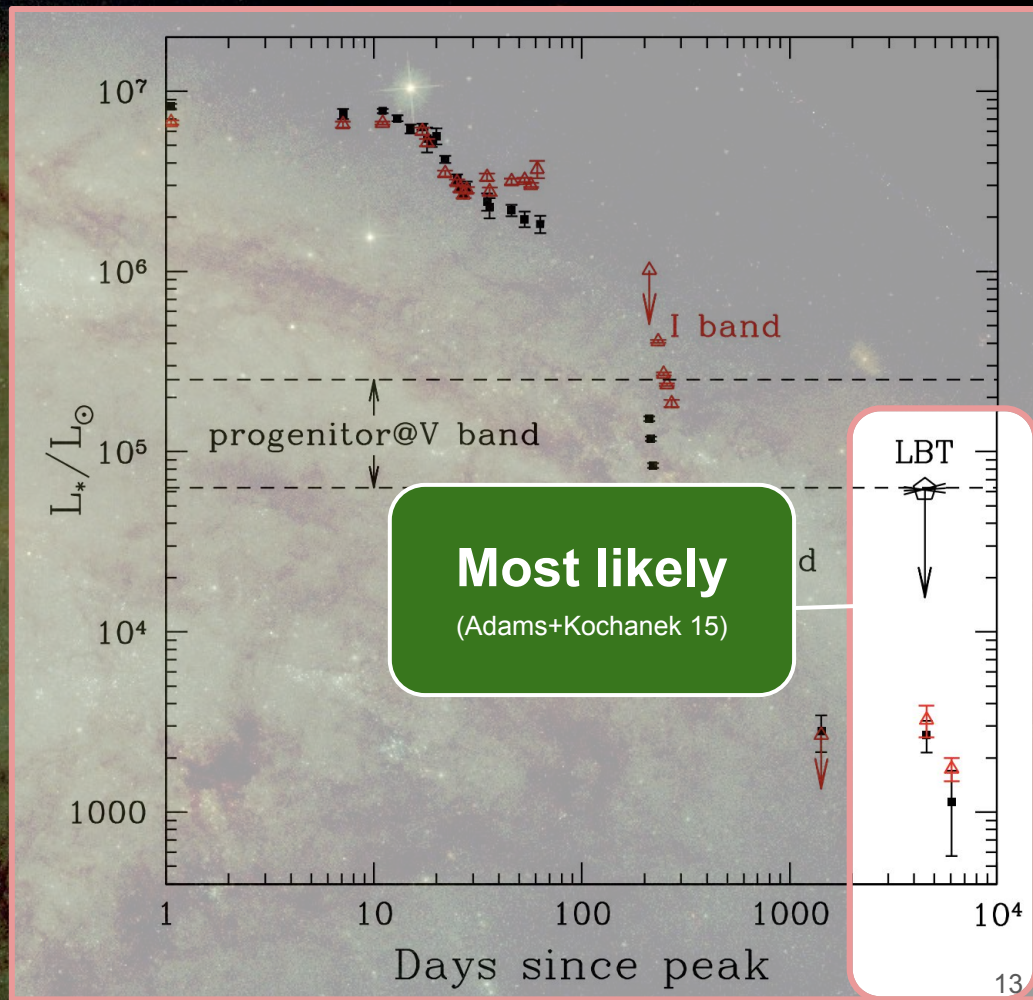


Did 1997bs explode?

Spitzer/IRAC

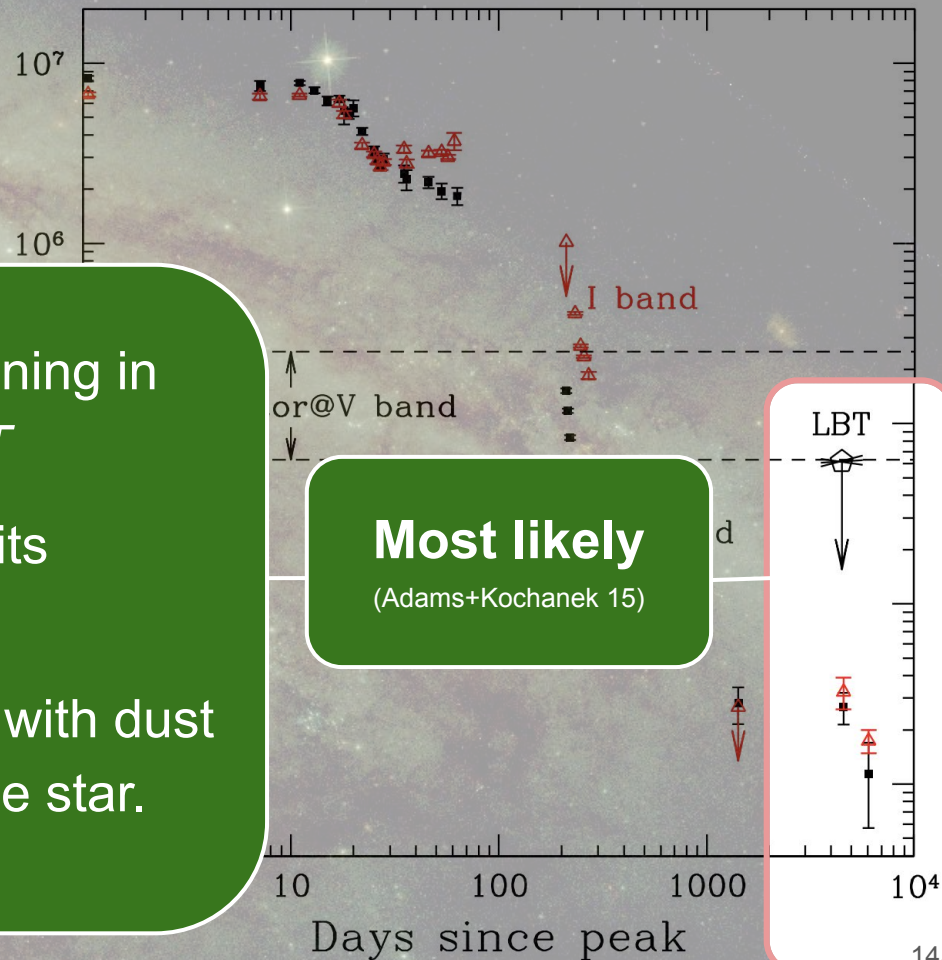


Did 1997bs explode?



Did 1997bs explode?

- No optical brightening in latest *LBT* or *HST*
- Latest *Spitzer* limits indicate dimming
- Hard to reconcile with dust shell obscuring the star.

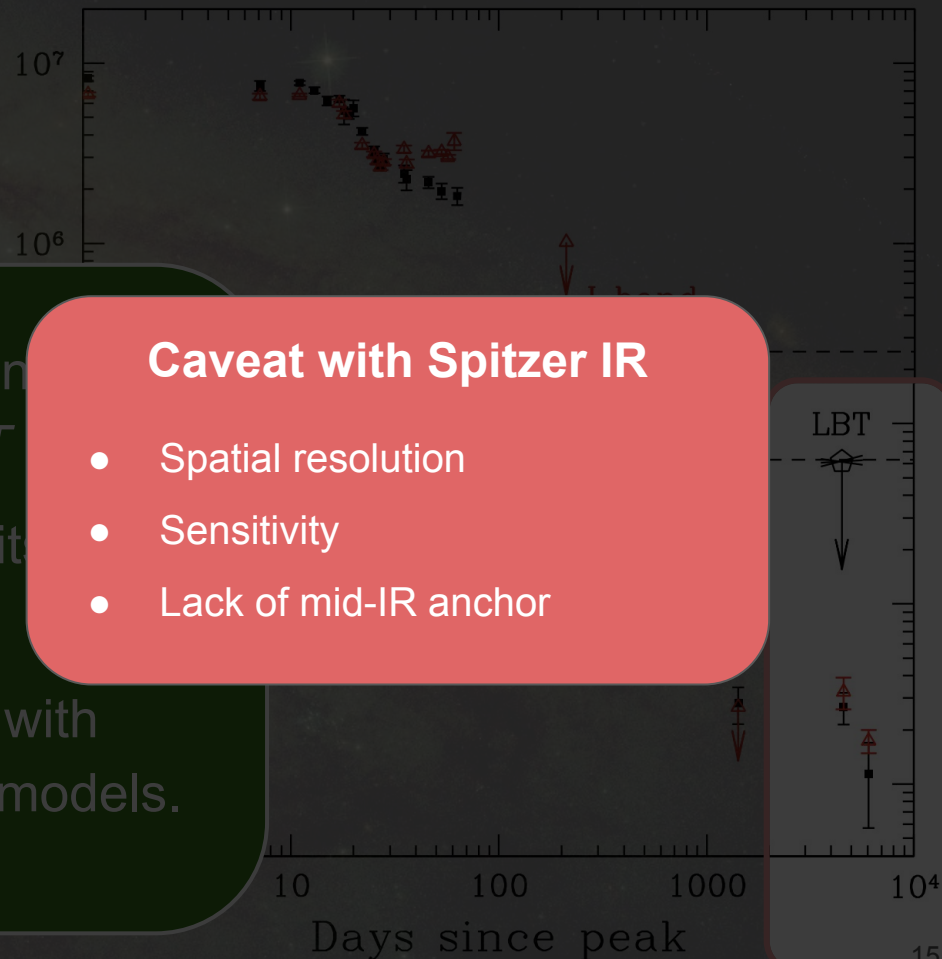


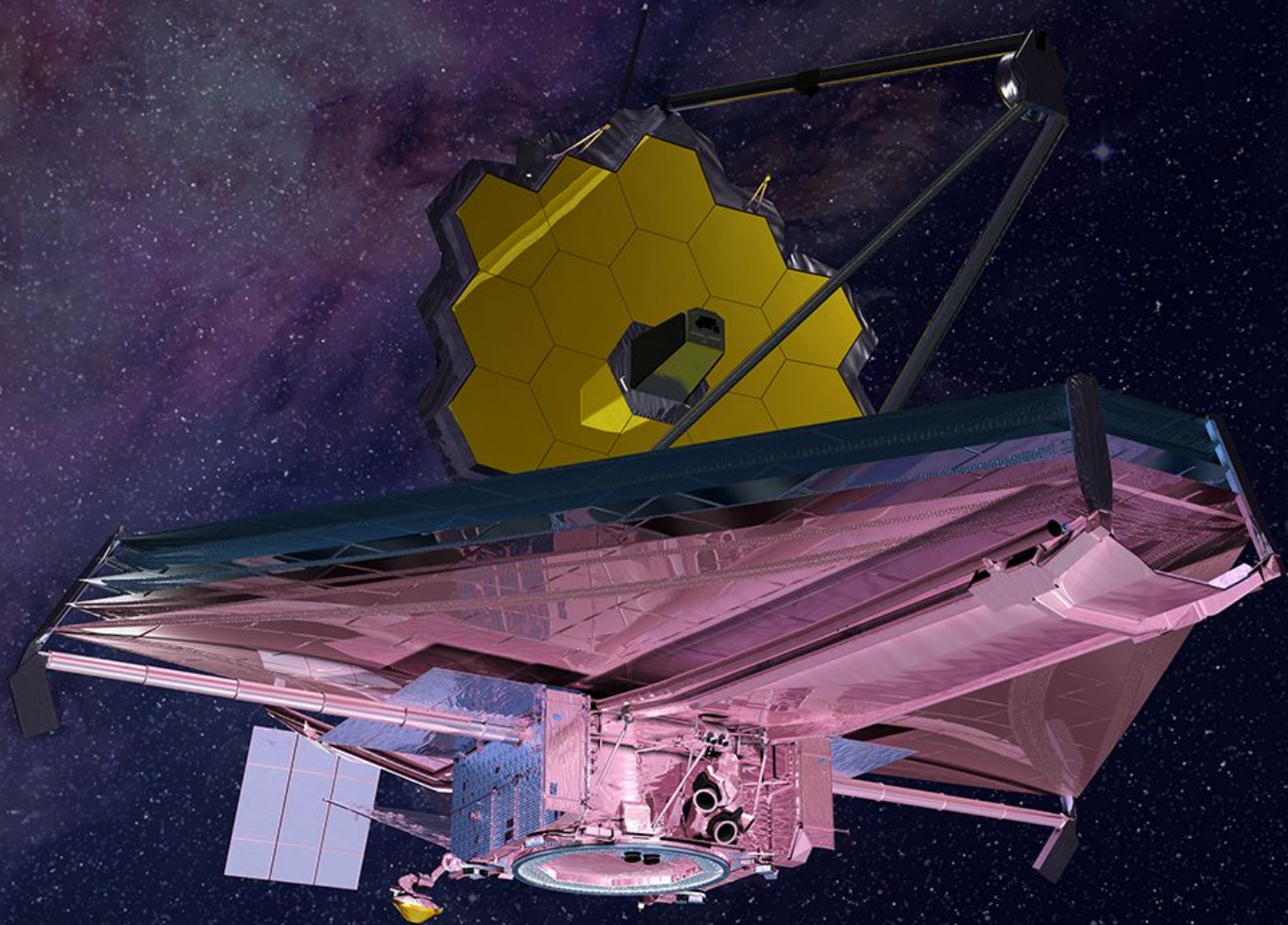
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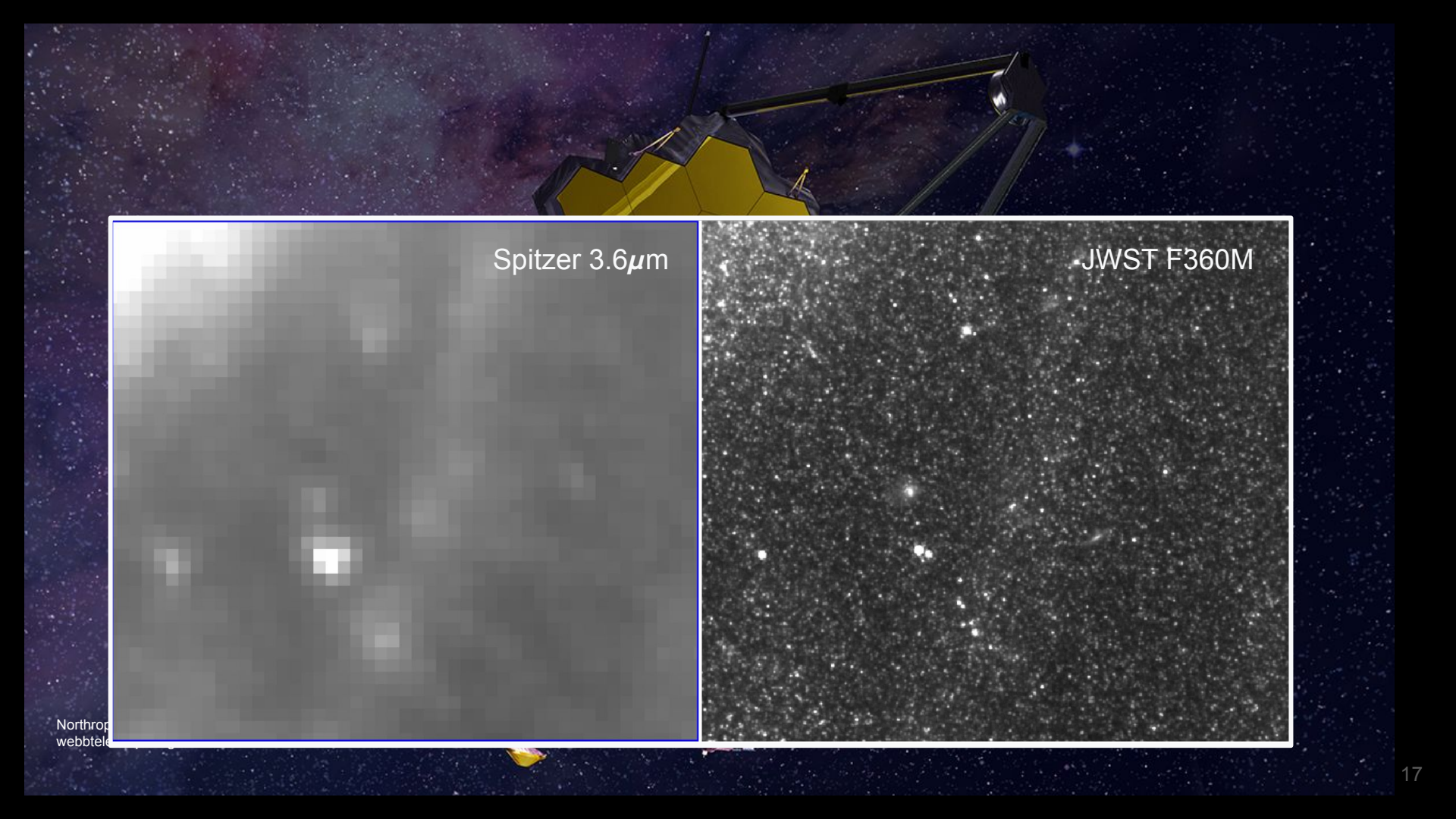
Caveat with Spitzer IR

- Spatial resolution
- Sensitivity
- Lack of mid-IR anchor





Northrop Grumman
webbtelescope.org



Spitzer 3.6 μ m

JWST F360M

PHANGS JWST



Phangs

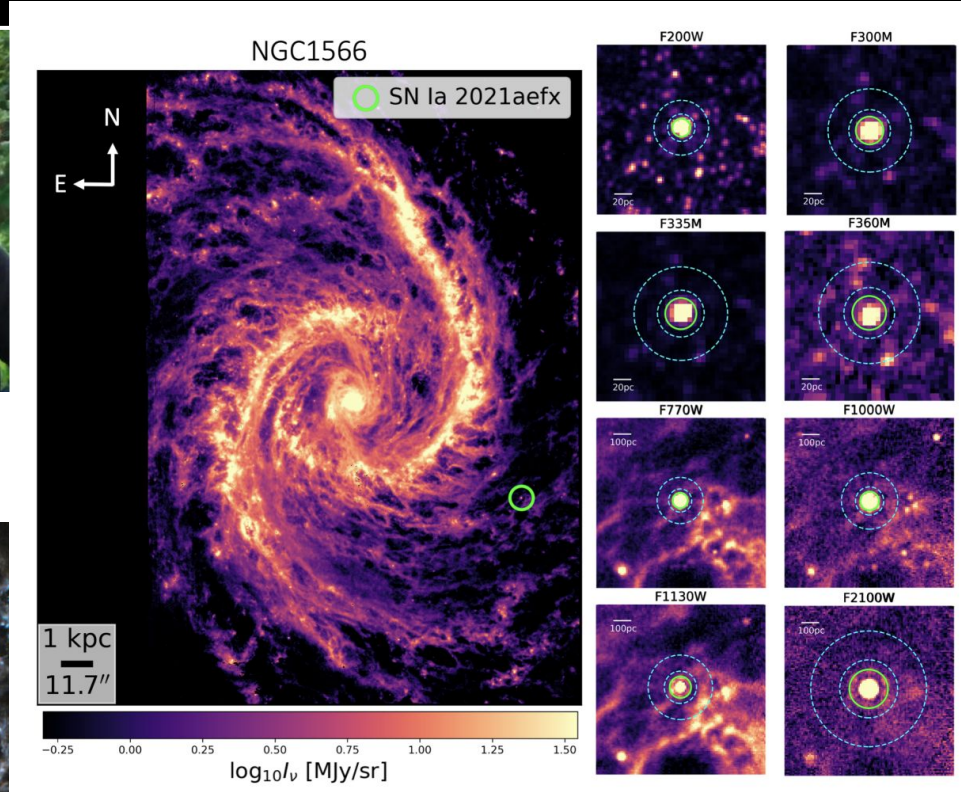
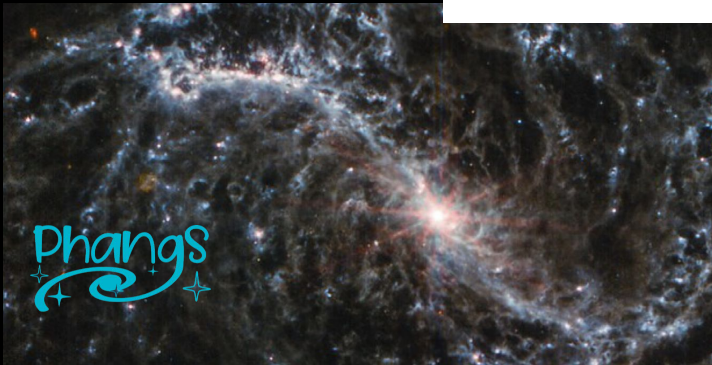


PHANGS JWST

Mayker Chen (incl. SKS)+ 2023



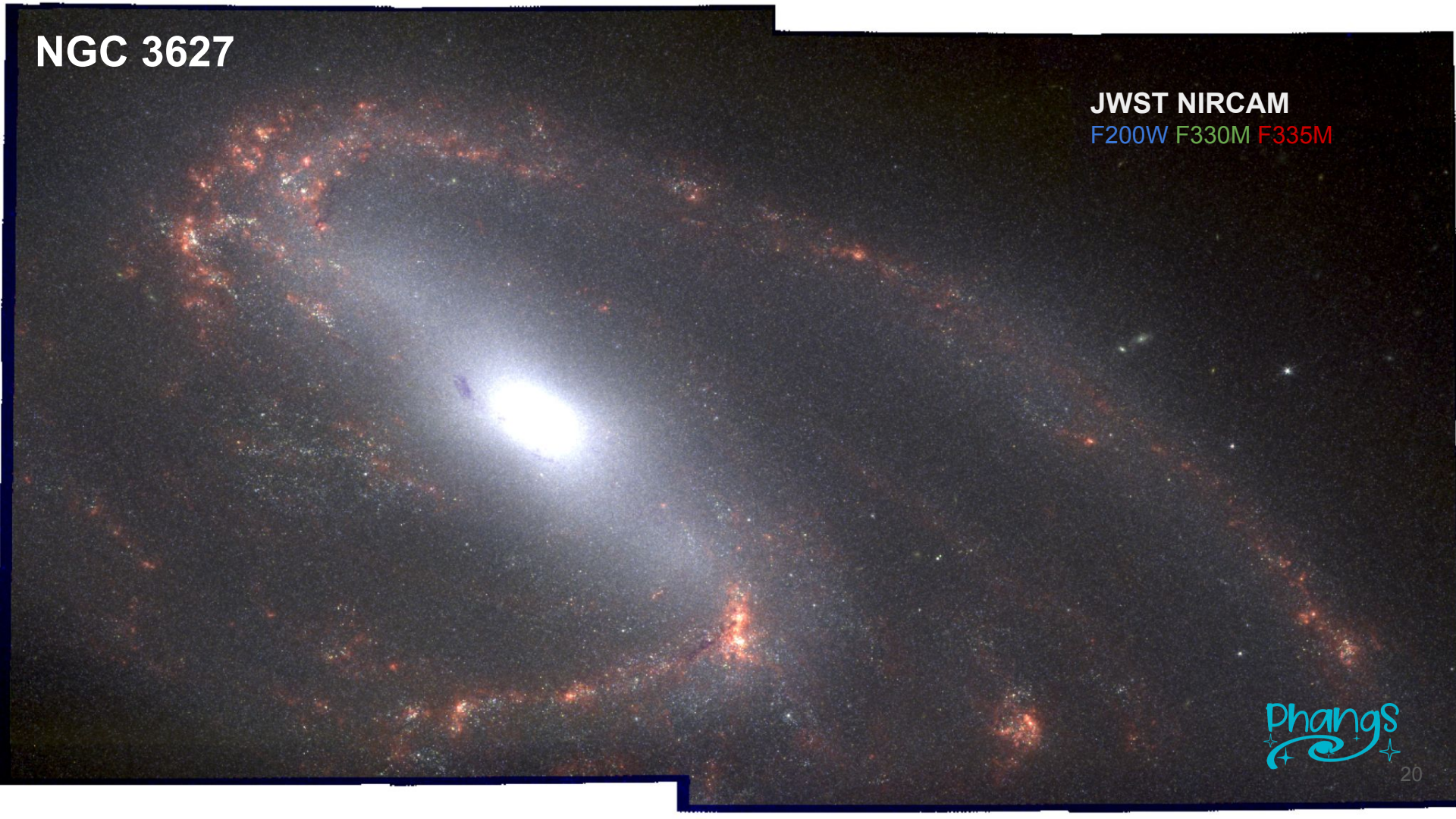
**Ness Mayker
Chen, OSU**

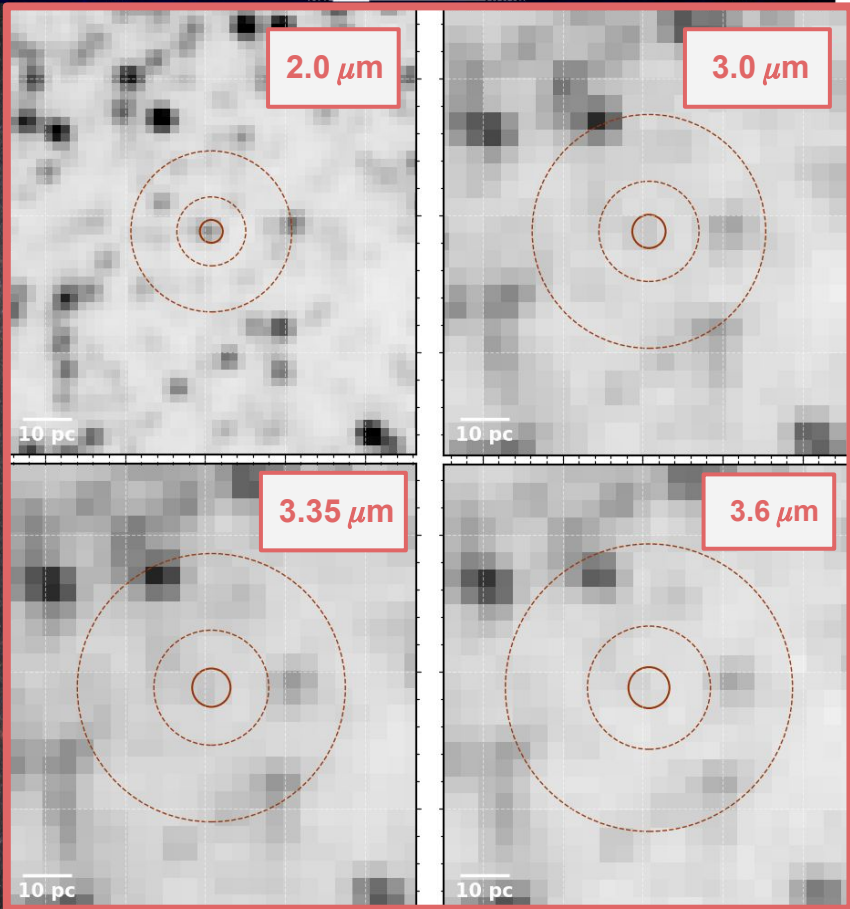


NGC 3627

JWST NIRCAM

F200W F330M F335M





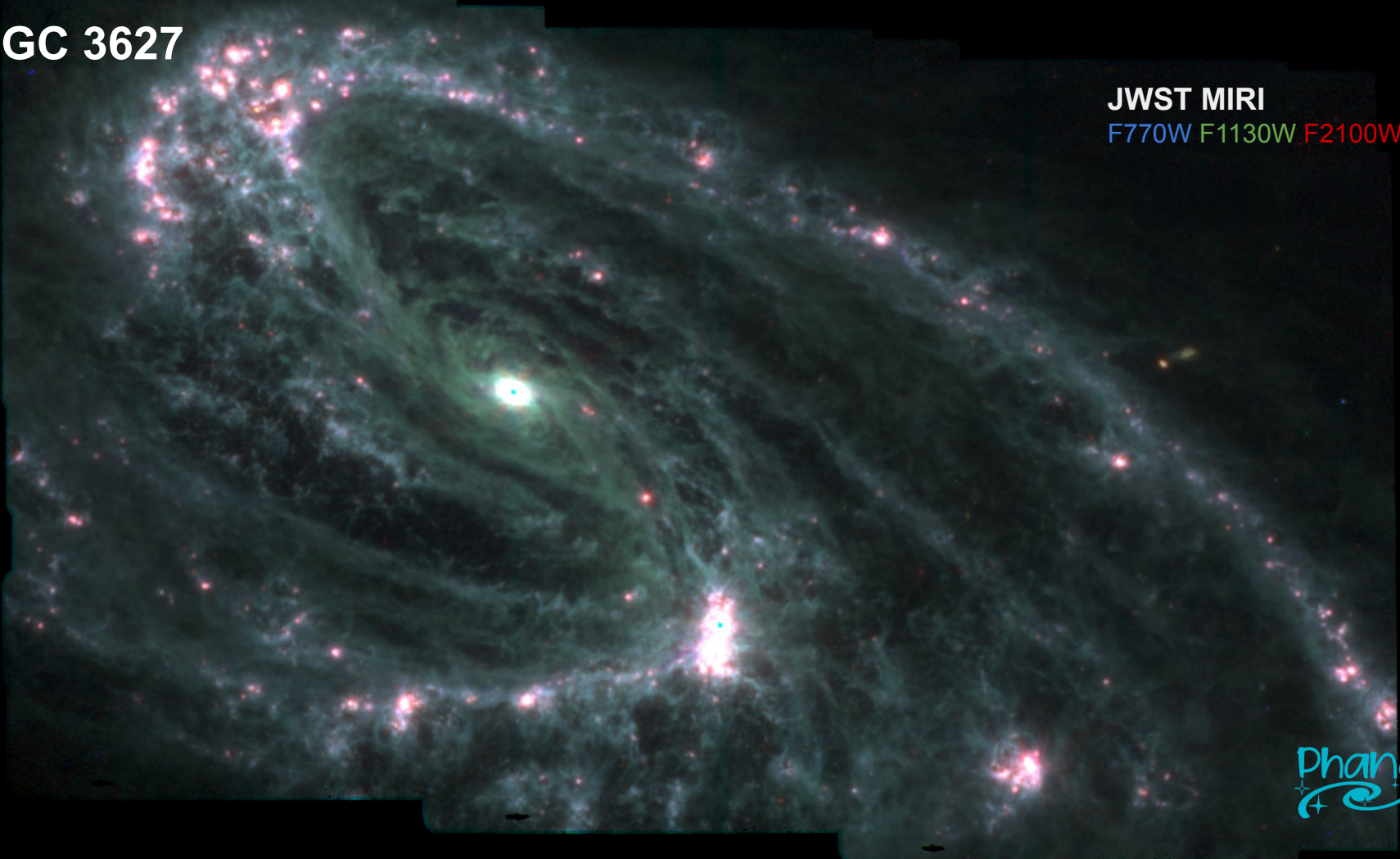
JWST NIRCAM
F200W F330M F335M



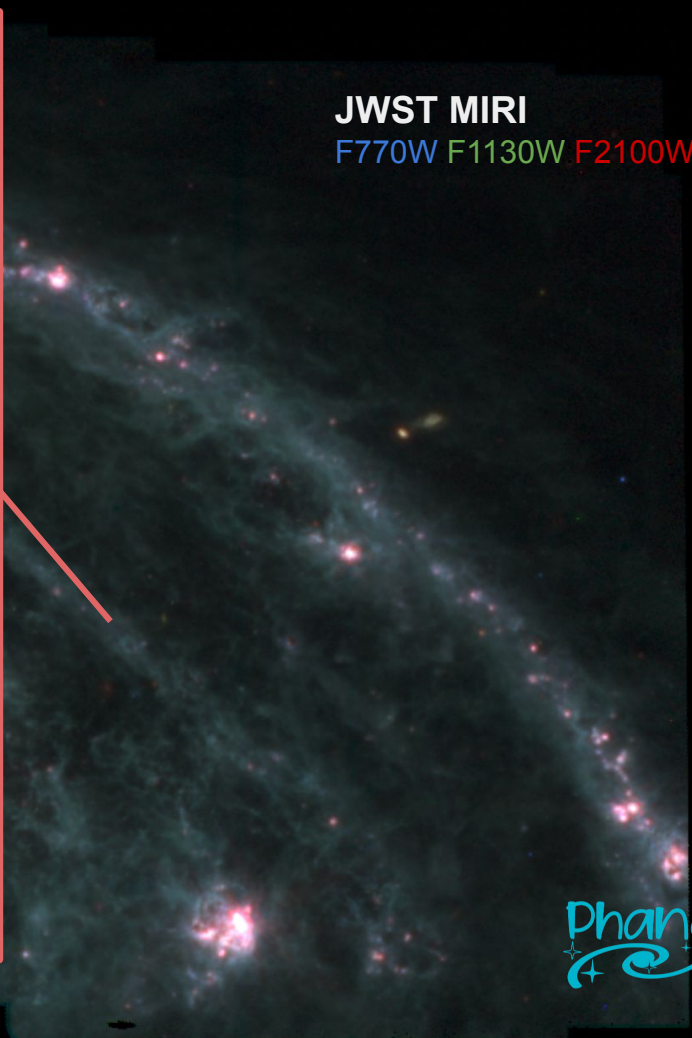
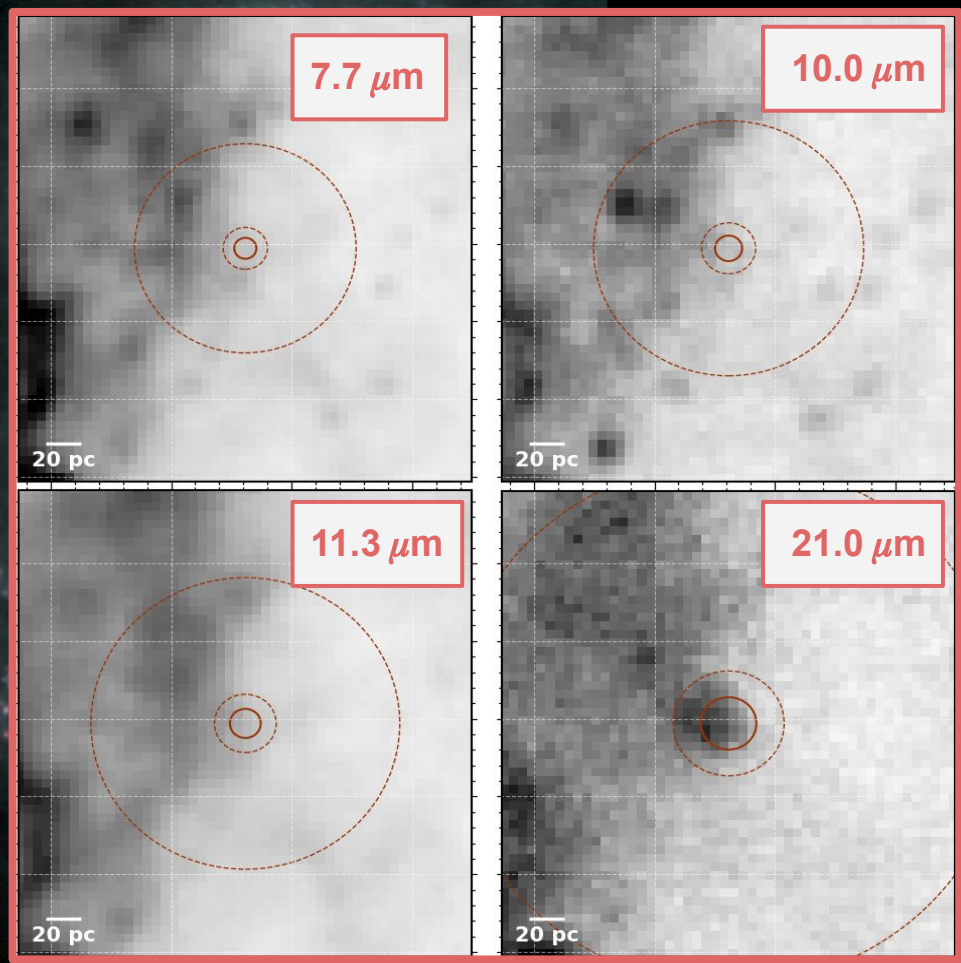
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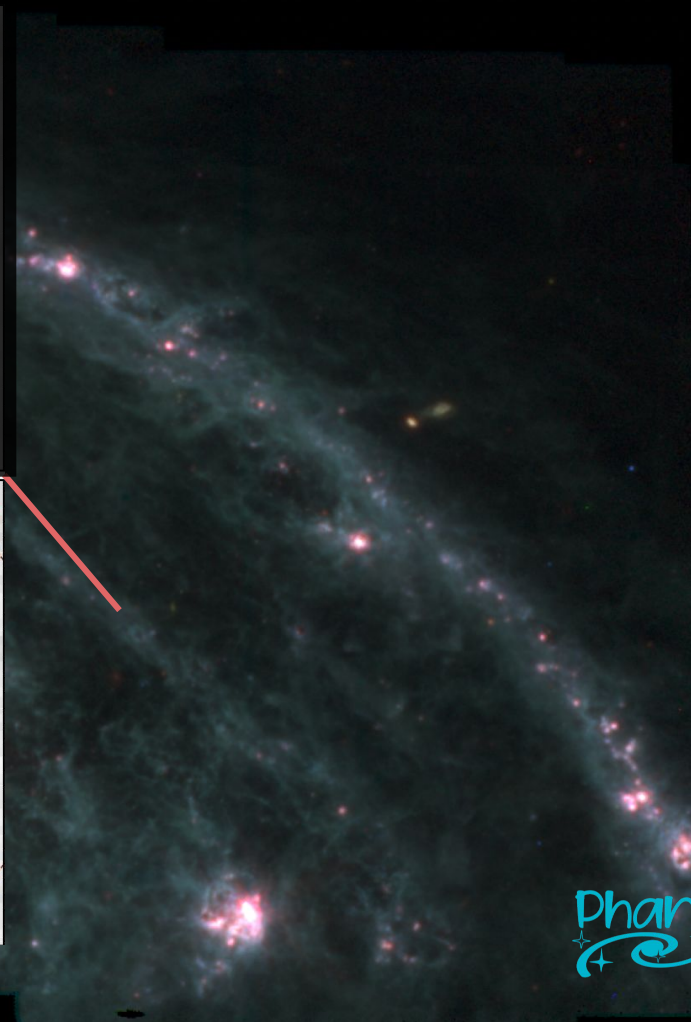
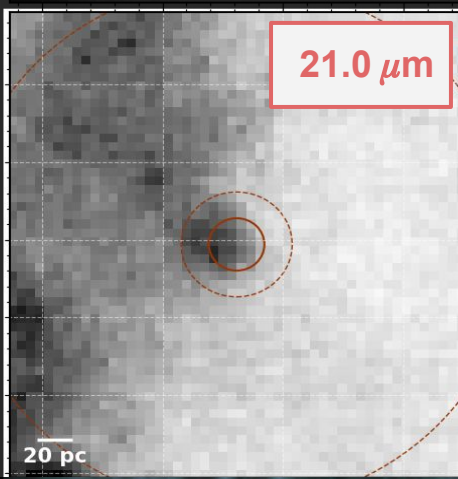
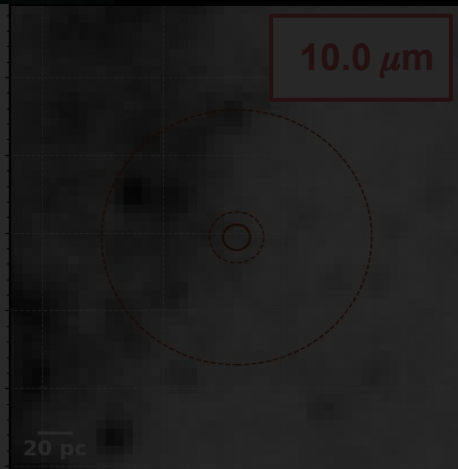
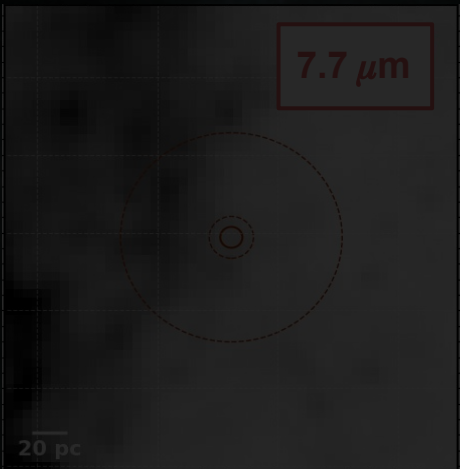
JWST MIRI

F770W F1130W F2100W

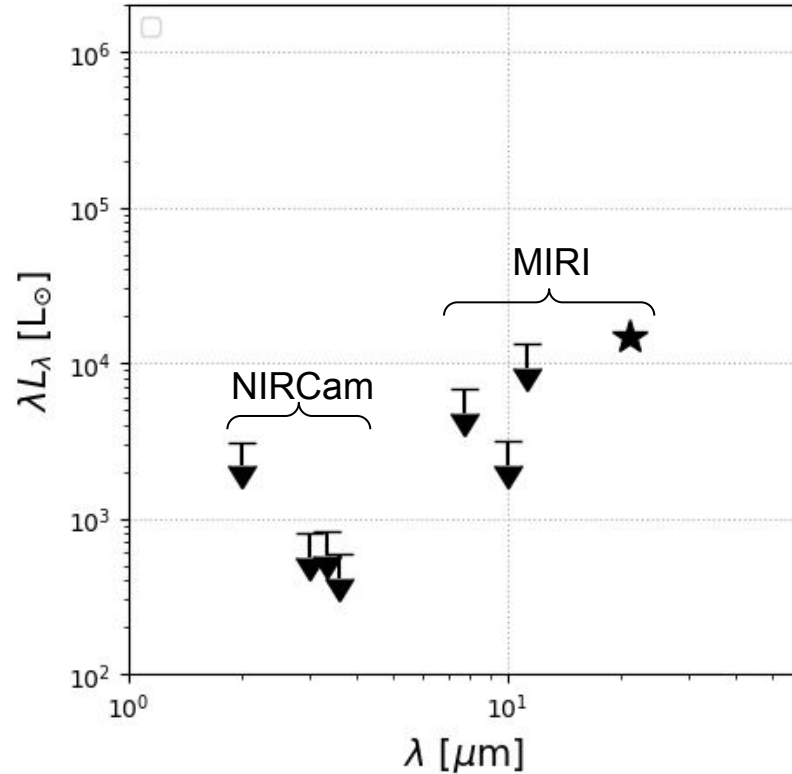


JWST MIRI
F770W F1130W F2100W

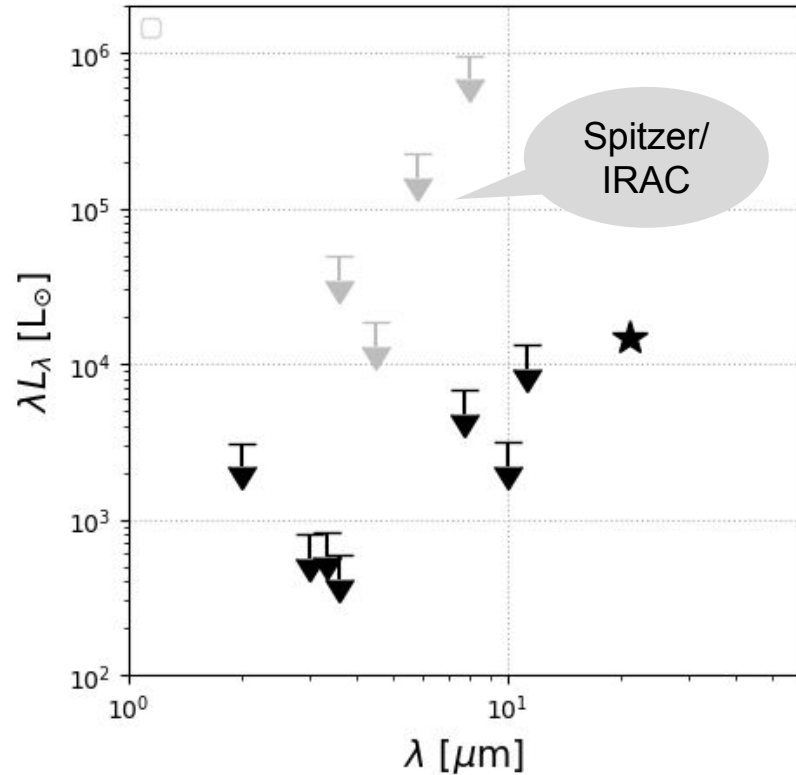




Is the near/mid-IR SED consistent with an obscured star?

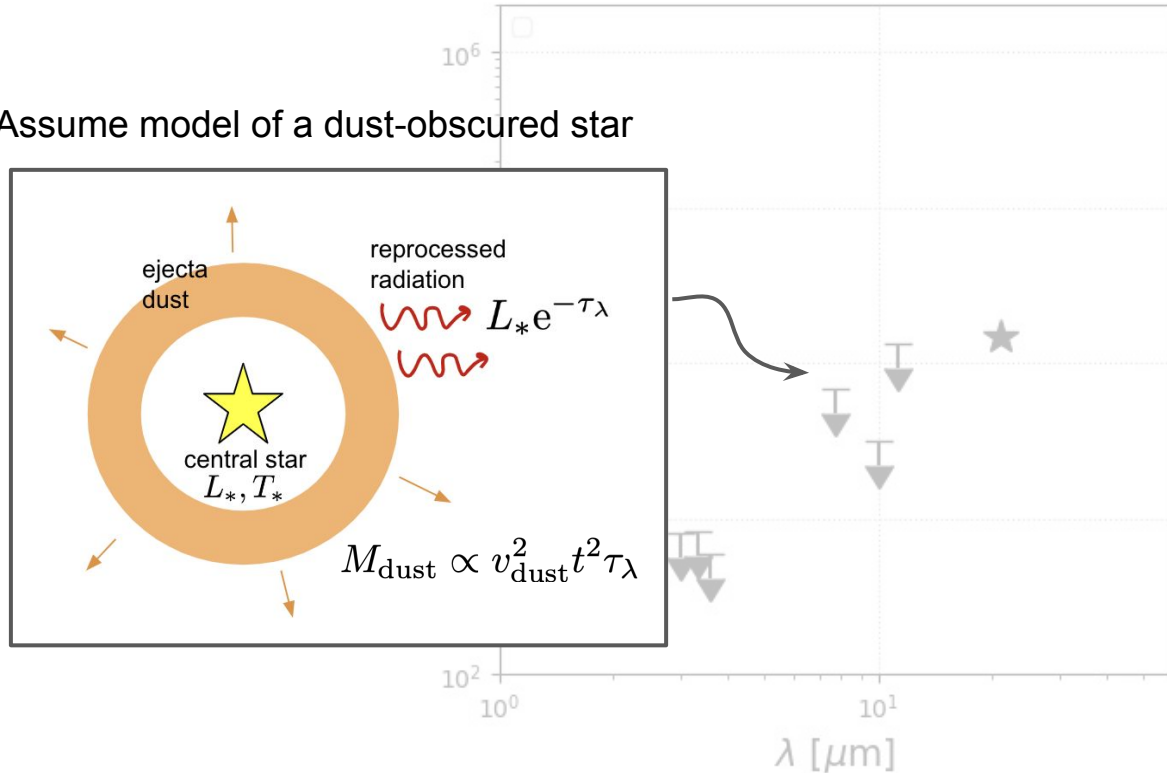


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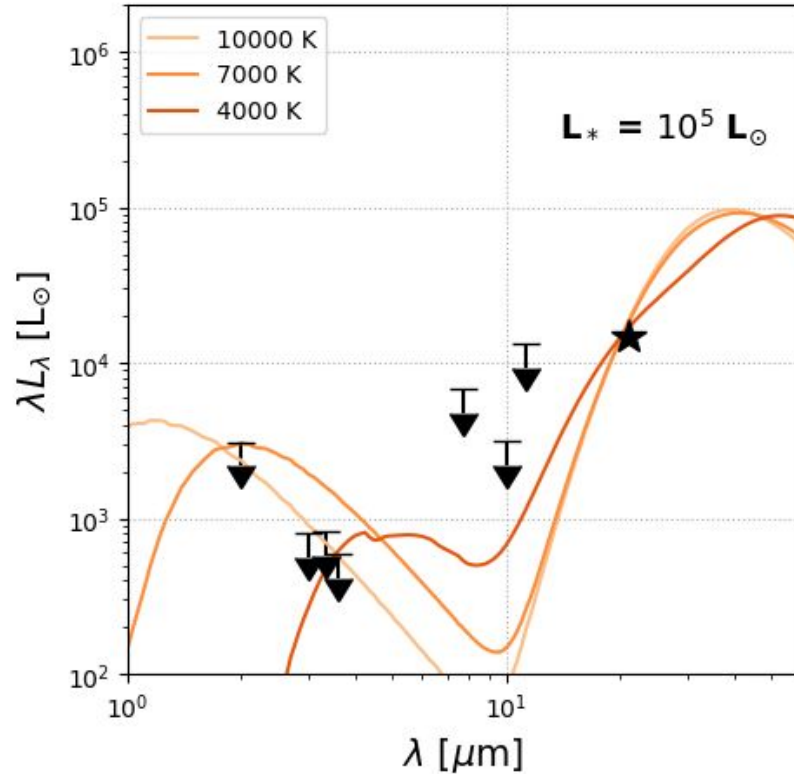


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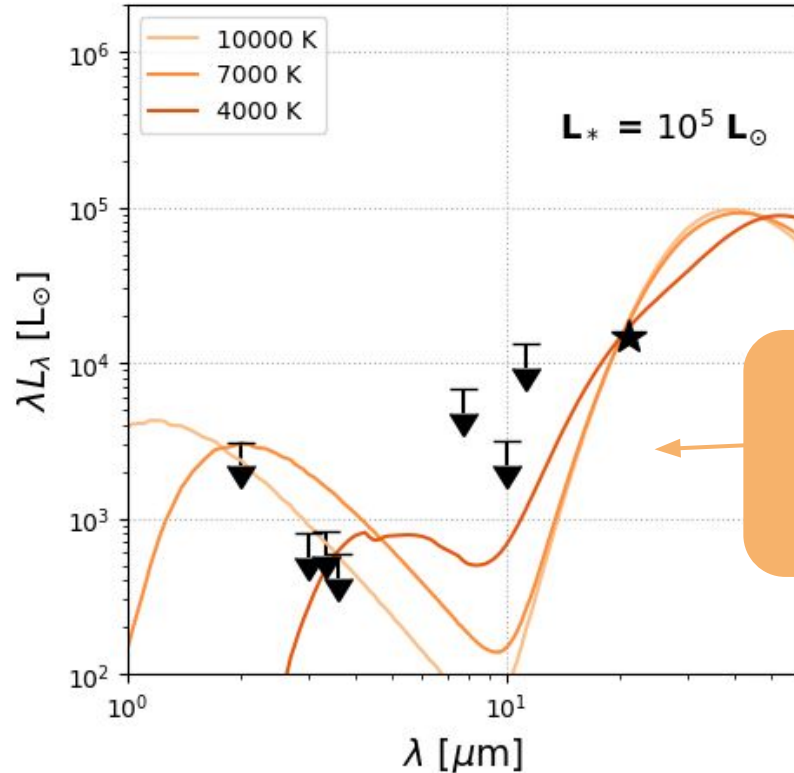
Assume model of a dust-obscured star



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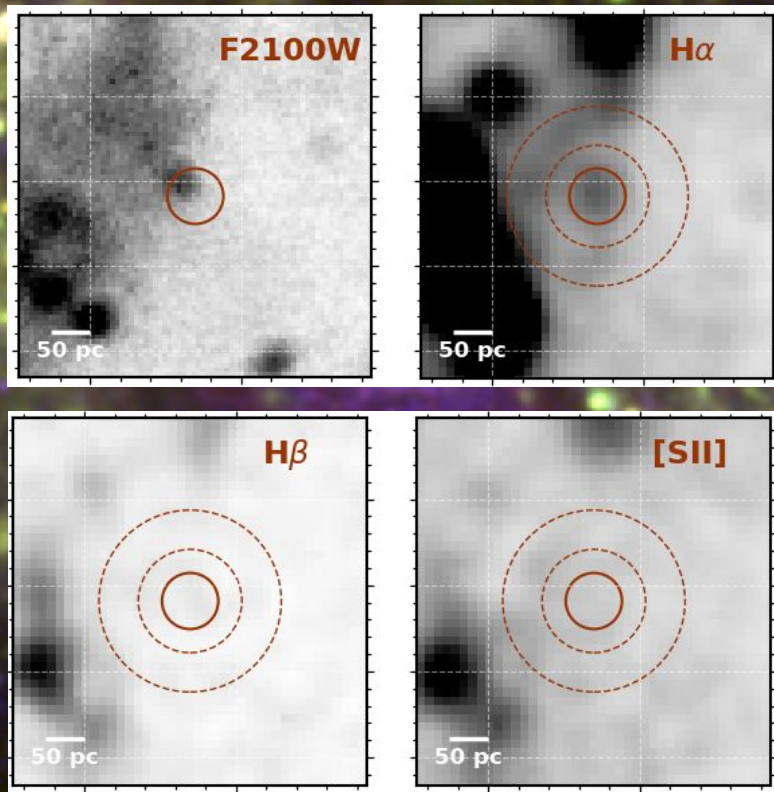
Required dust shell masses too high
 $M_{\text{dust}} \sim 40 - 400 M_\odot$

NGC 3627

VLT/MUSE
[OIII]:H α : [SII]

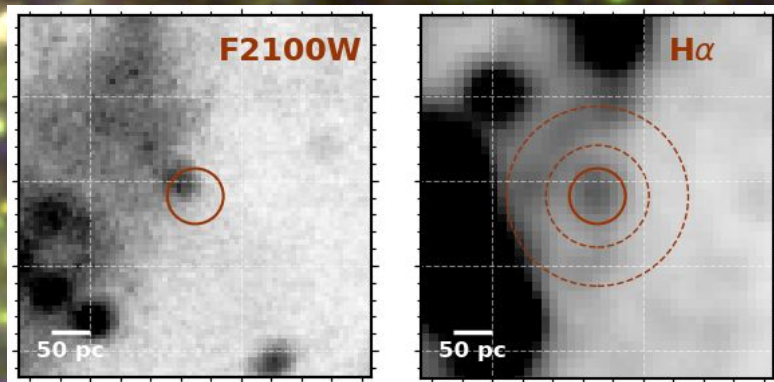
Phangs

NGC 3627



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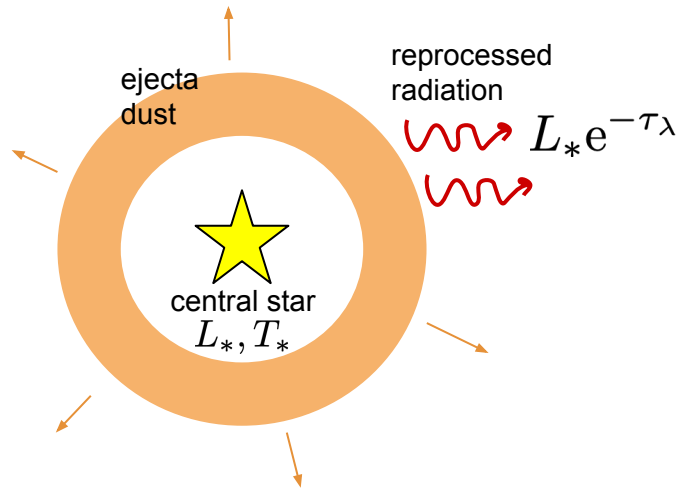
Consistent with small HII region

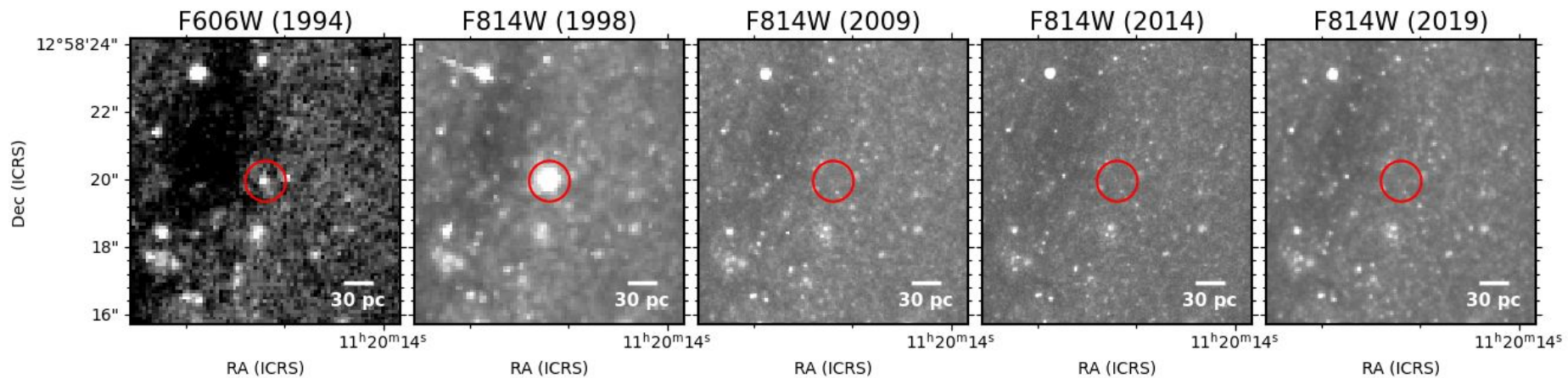
- $\sigma \sim 36$ km/s
- $[\text{SII}]/\text{H}\alpha < 0.4$
- $\text{H}\alpha/21\mu\text{m} \sim 0.01\text{-}0.05$

Summary

The archetypal “imposter” SN 1997bs was a real SN based on JWST because

- No near-IR detection from 2-11 μm , only a blob in 21 μm filter
- Would require “cool” dusty shell, but very high mass (40-400 M_{\odot}) to obscure a luminous supergiant even after 25 years.
- IFU data indicates 21 μm blob is likely a small Orion-like HII region, i.e. not circumstellar in origin





IFU maps indicate the $21\mu\text{m}$ source is a small HII region

