Investigating Expansion and Extinction in the Planetary Nebula NGC 7027 with HST

01/15/2021 Paula Moraga

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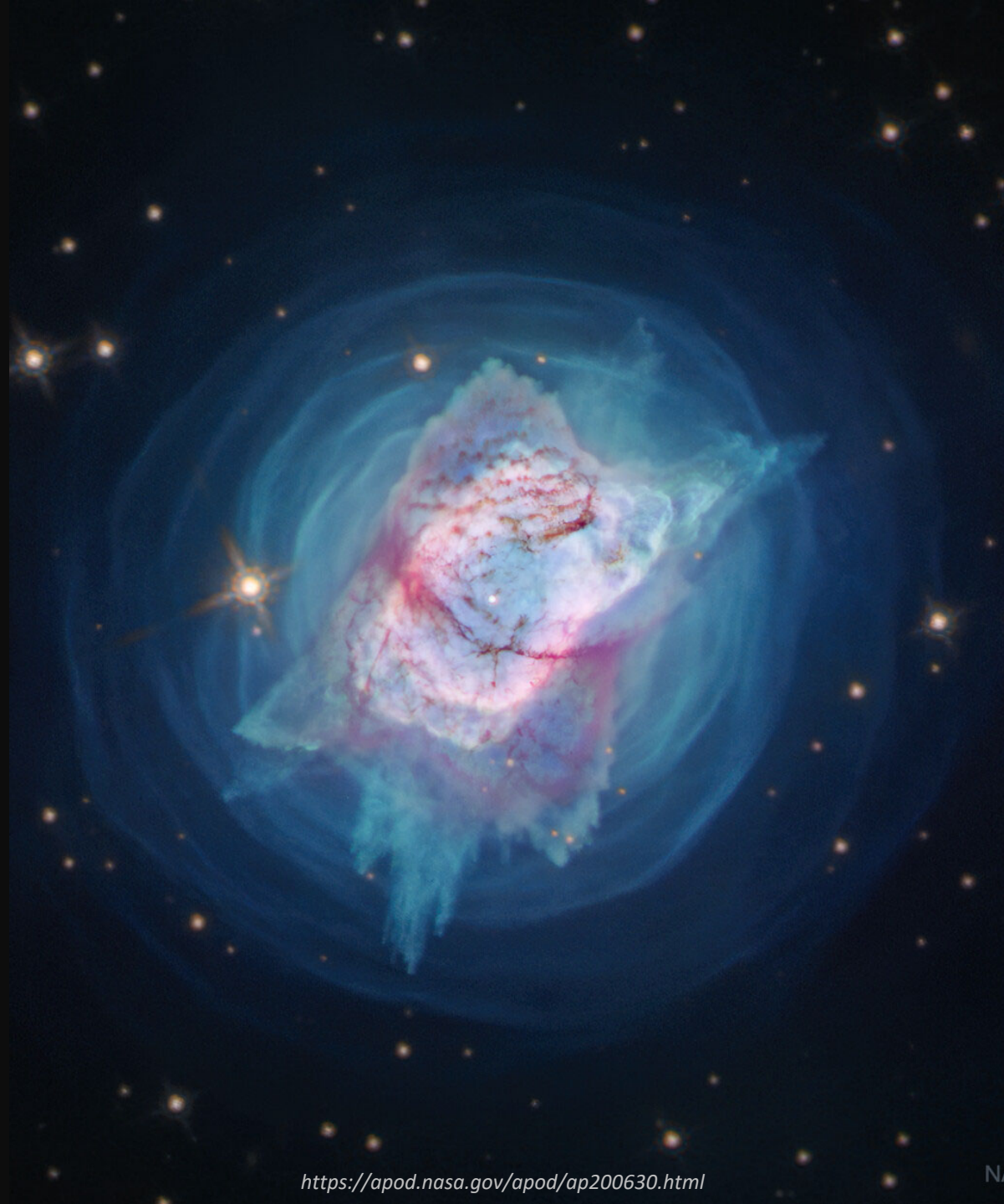
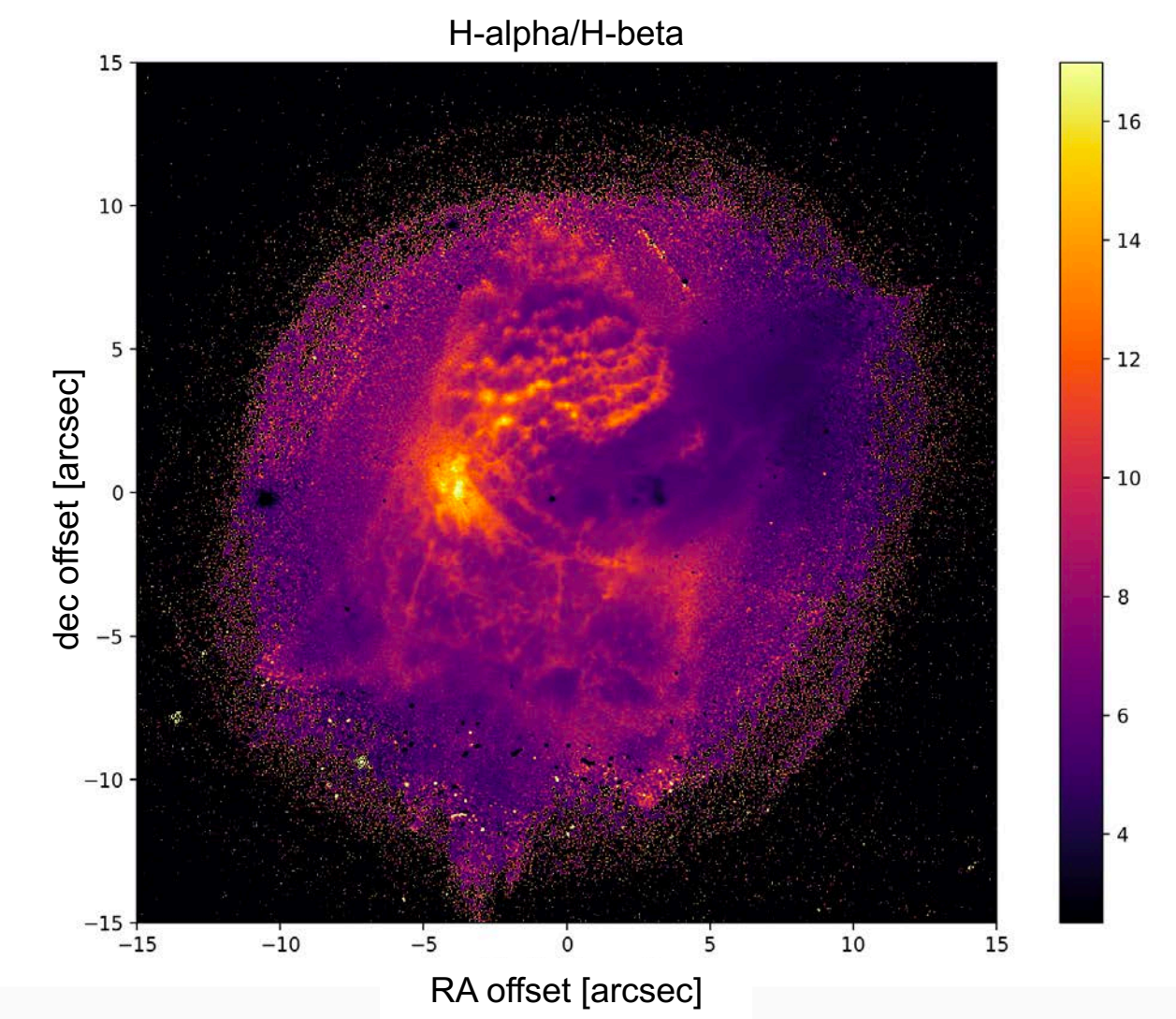
NGC 7027

- Young (dynamical age ~ 1000 yr), rapidly evolving planetary nebula
- Complex juxtaposition of shapes
  - Image at right: STSci montage of our HST/WFPC3 images
- Hot central star ($T_{eff} \sim 200k$K)
- Distance of ~ 890pc (Masson 1989)
- Large mass of dust and molecular gas
  - See next talk (507.003 Bublitz et al)



https://apod.nasa.gov/apod/ap200630.html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−5
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−15
16
14
12
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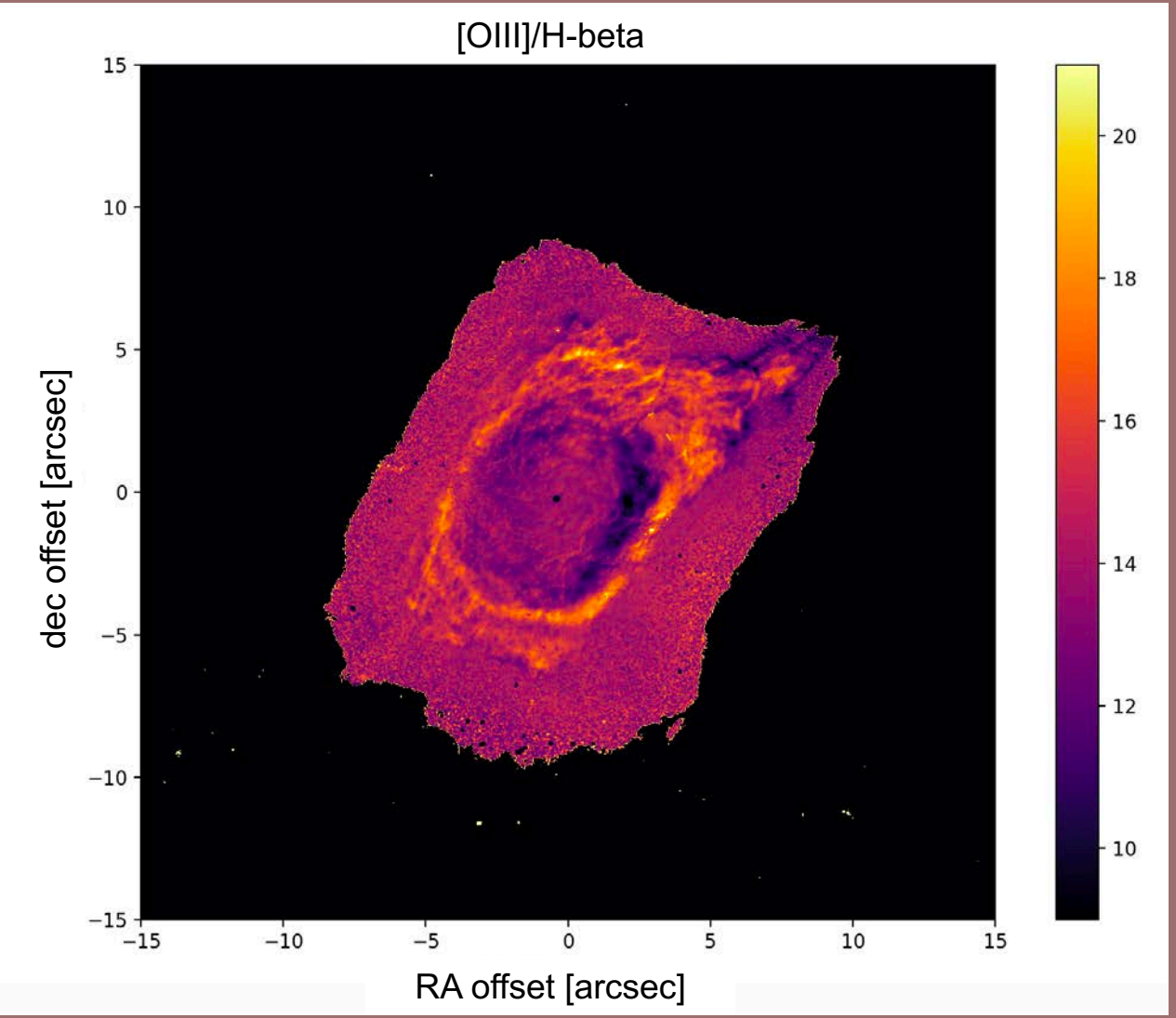
8
6
4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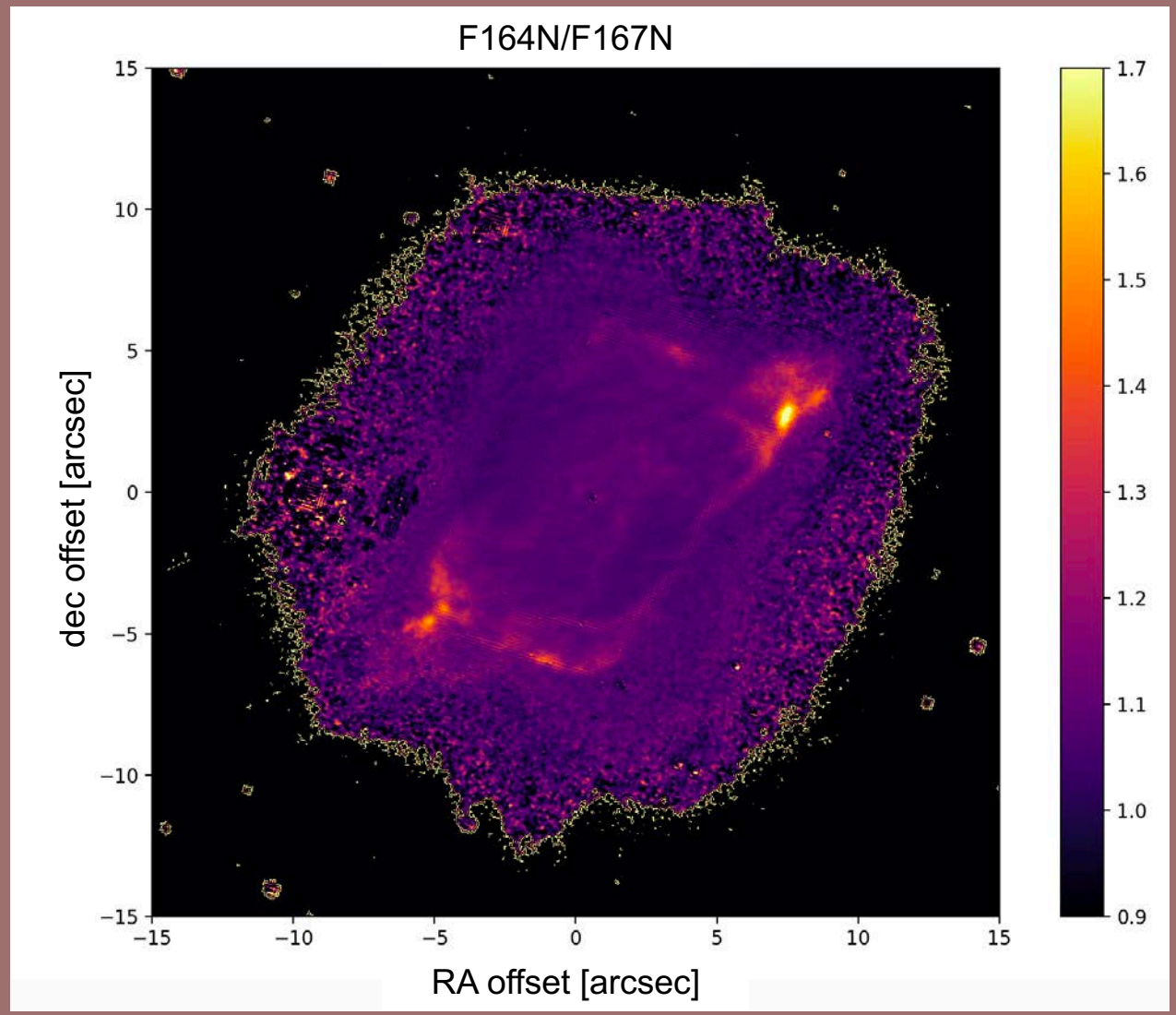
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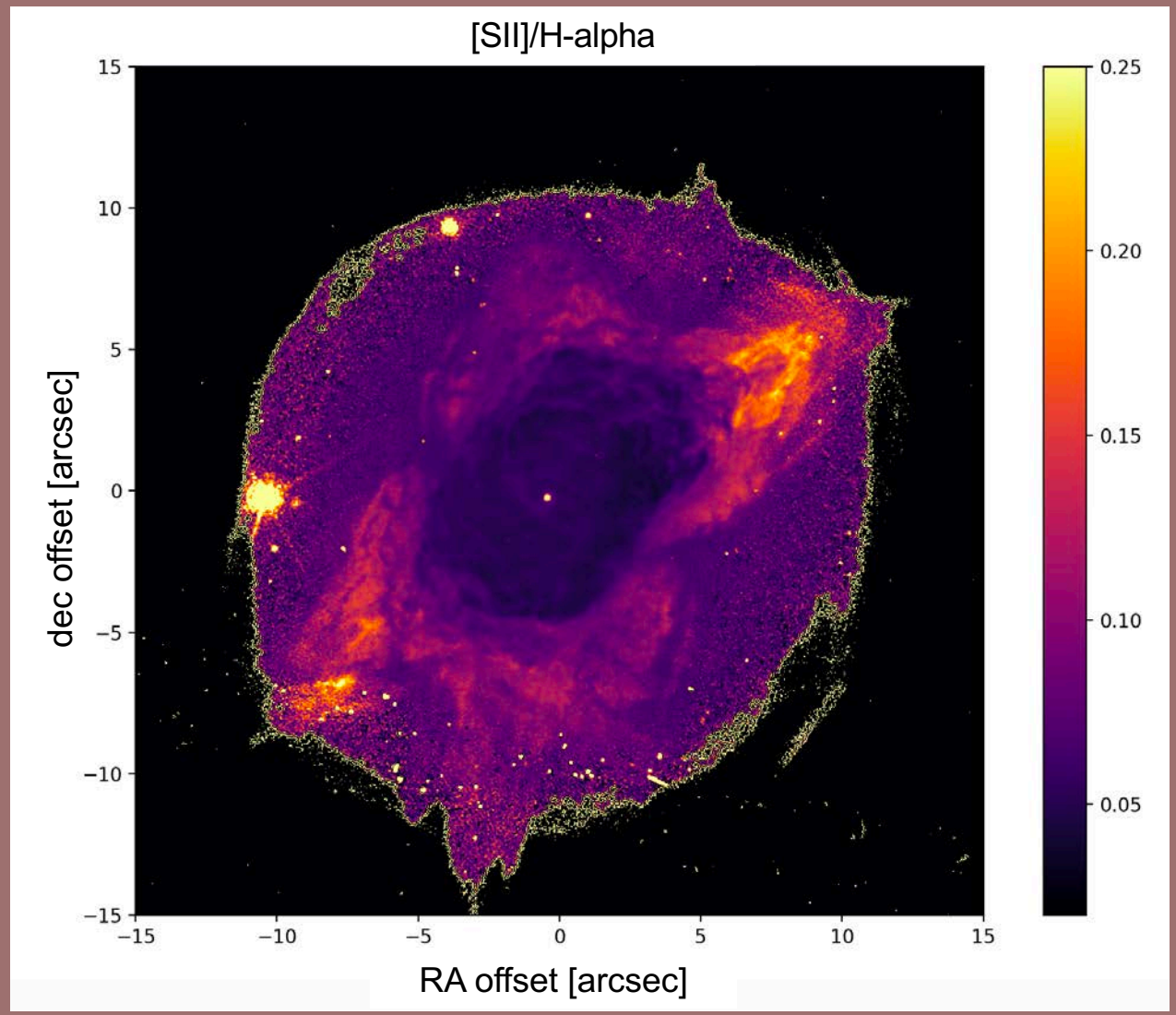
1.4
1.3
1.2
1.1
1.0
0.9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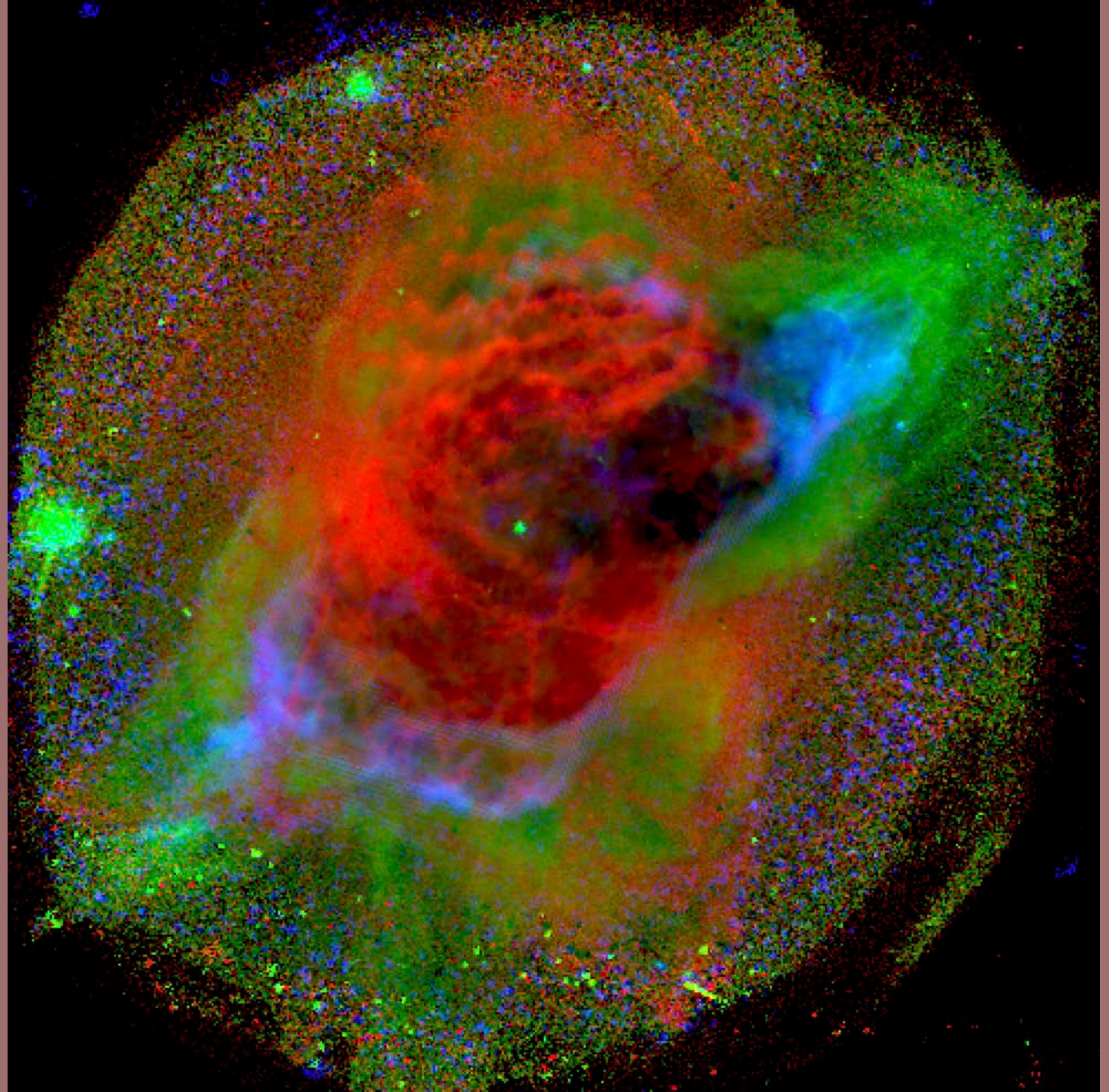
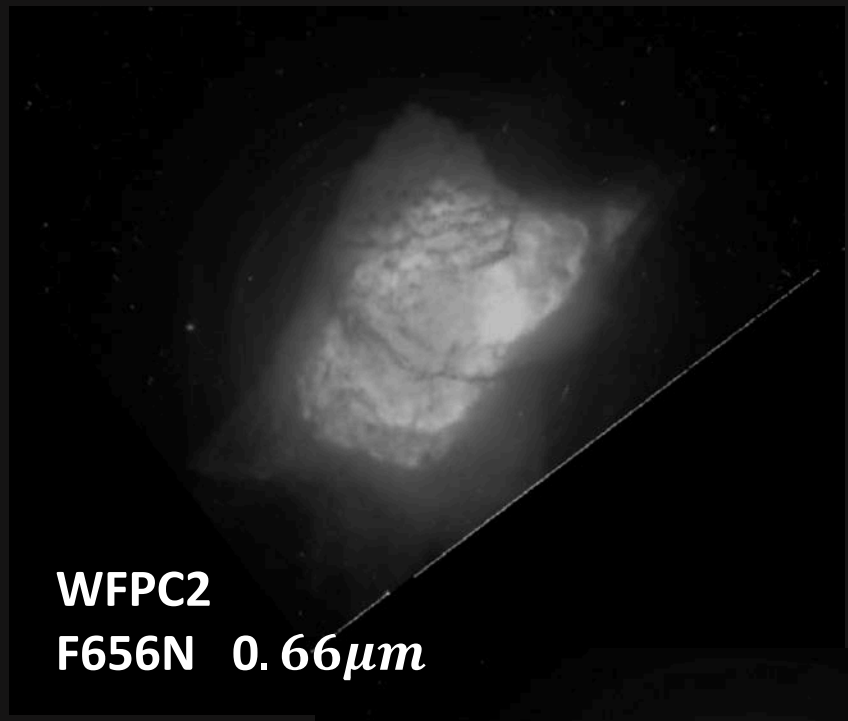
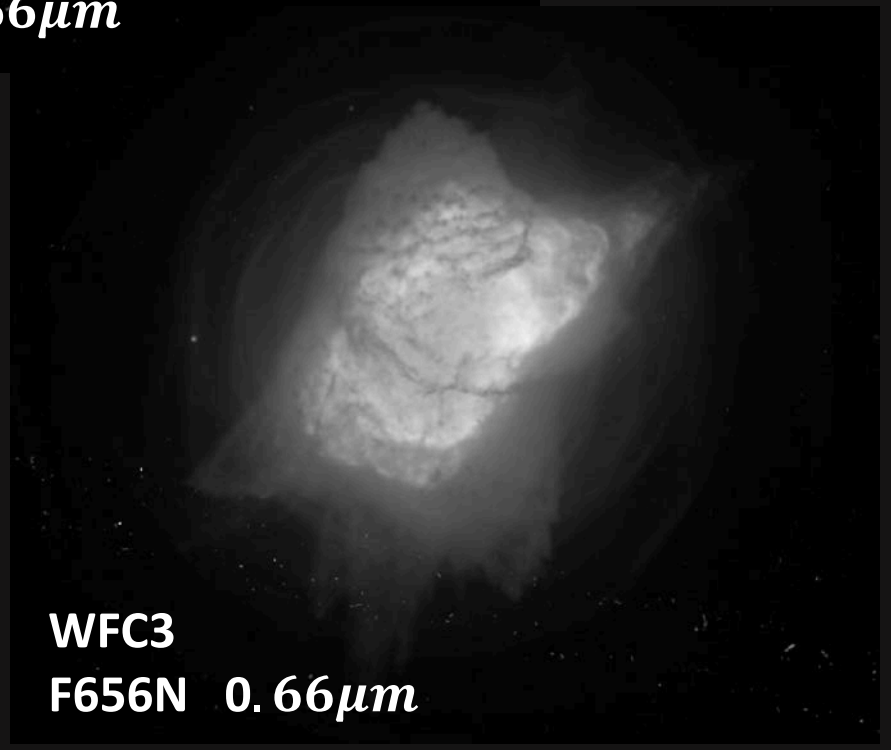
0.15
0.10
0.05



- How to measure expansion?
  - Take an old image and a new image to create a difference image
- Working with WFPC2 (2009) and WFC3 (2019) images
  - Reprojection needed
  - Careful analysis of filter throughput ratio vs brightness of nebula



WFPC2
F656N 0.66μm



WFC3
F656N 0.66μm

- Measurements of flux were taken at 9 different wavelengths
- Tübingen NLTE Model-Atmosphere for a WD of 200,000 K
  - Values for log(g) were compared
- Extinction model was used from Cardelli et al 1989
- Best-fit extinction: $A_V = 2.57 \pm 0.15$