

The environment of Central Compact Objects ...

... with optical IFS.

Frédéric Vogt¹ - ESO Fellow

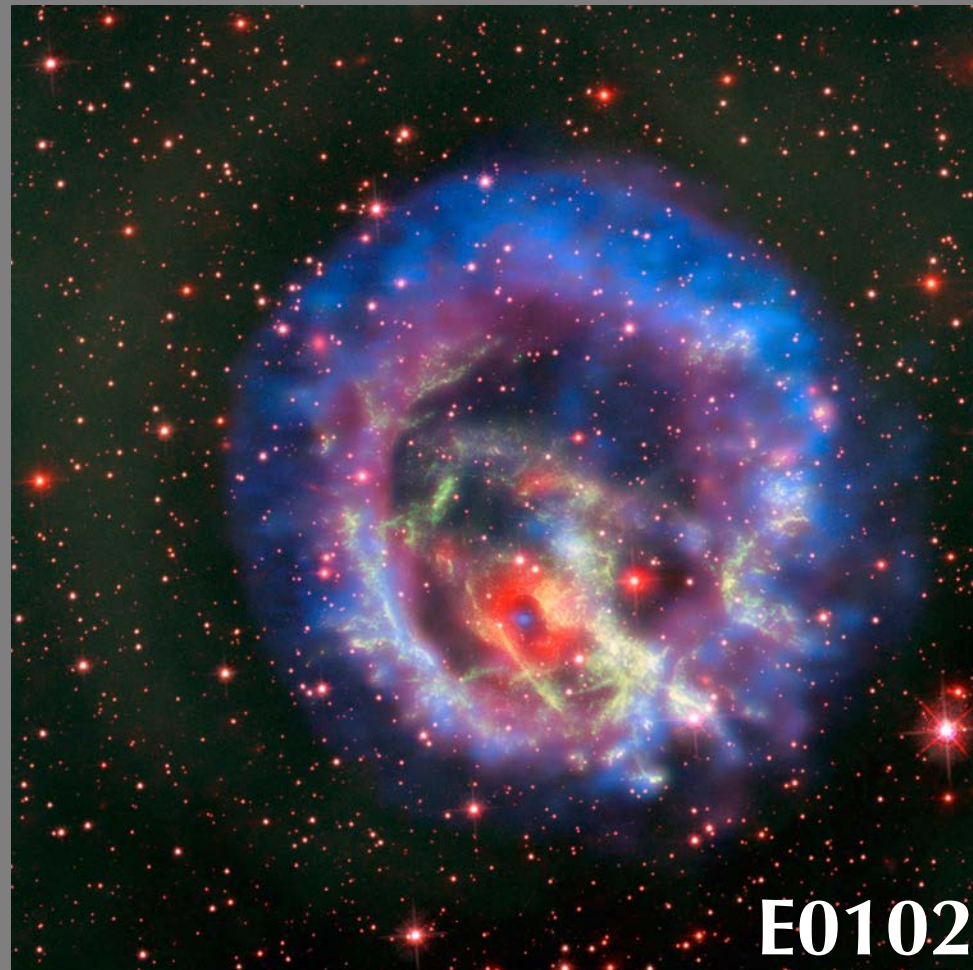
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with

I.R. Seitenzahl², P. Ghavamian³, A.J. Ruiter²,

and

E.S. Bartlett¹, M.A. Dopita⁴.



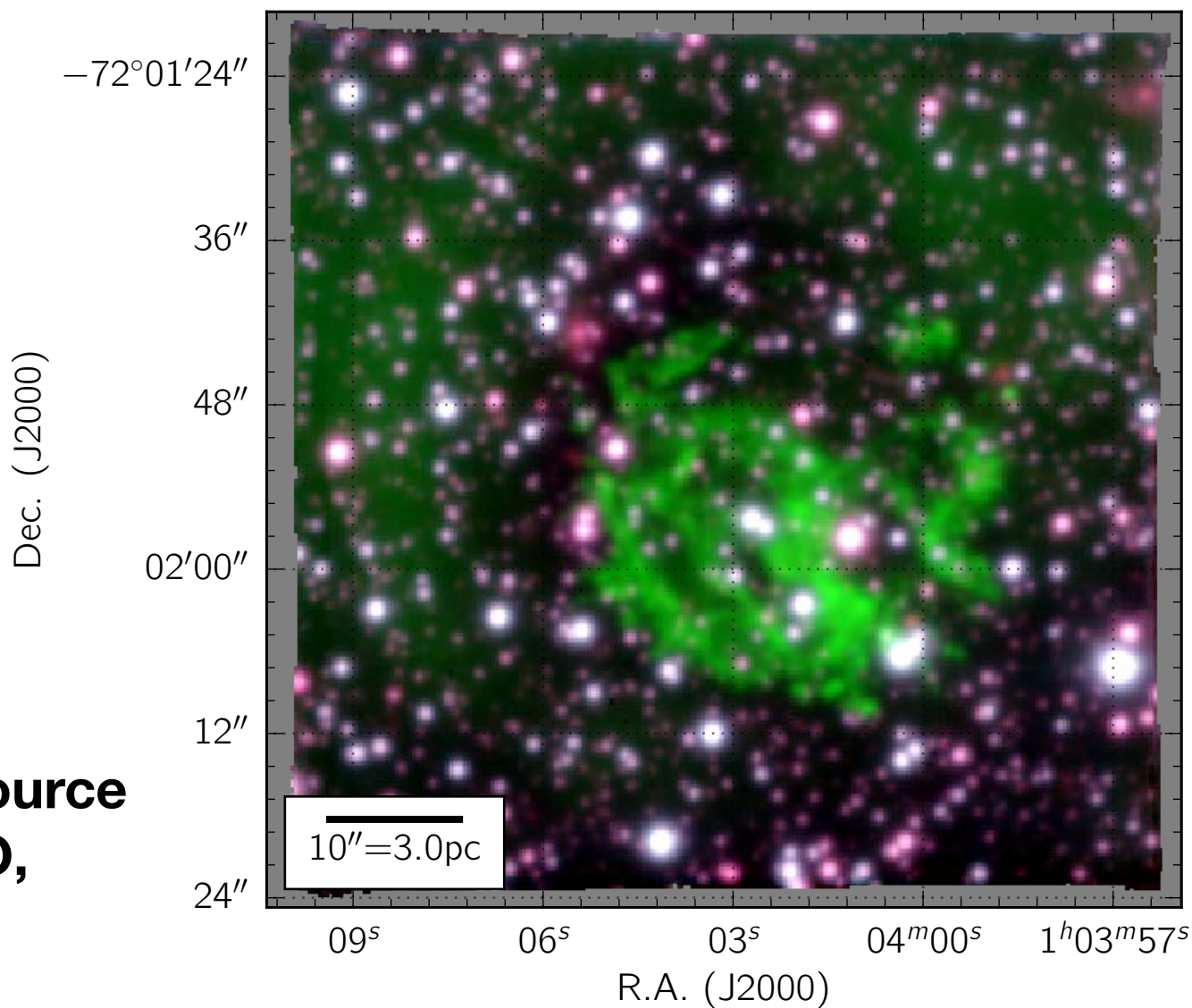
1: ESO, Santiago, Chile, 2: University of New South Wales - ADFA, Canberra, Australia,
3: Towson University, USA, 4: Australian National University, Canberra, Australia.

Going after Sulfur ...

MUSE @ VLT:

=> 8100s on-source

**=> WFM-NOAO,
IQ~0.7''**



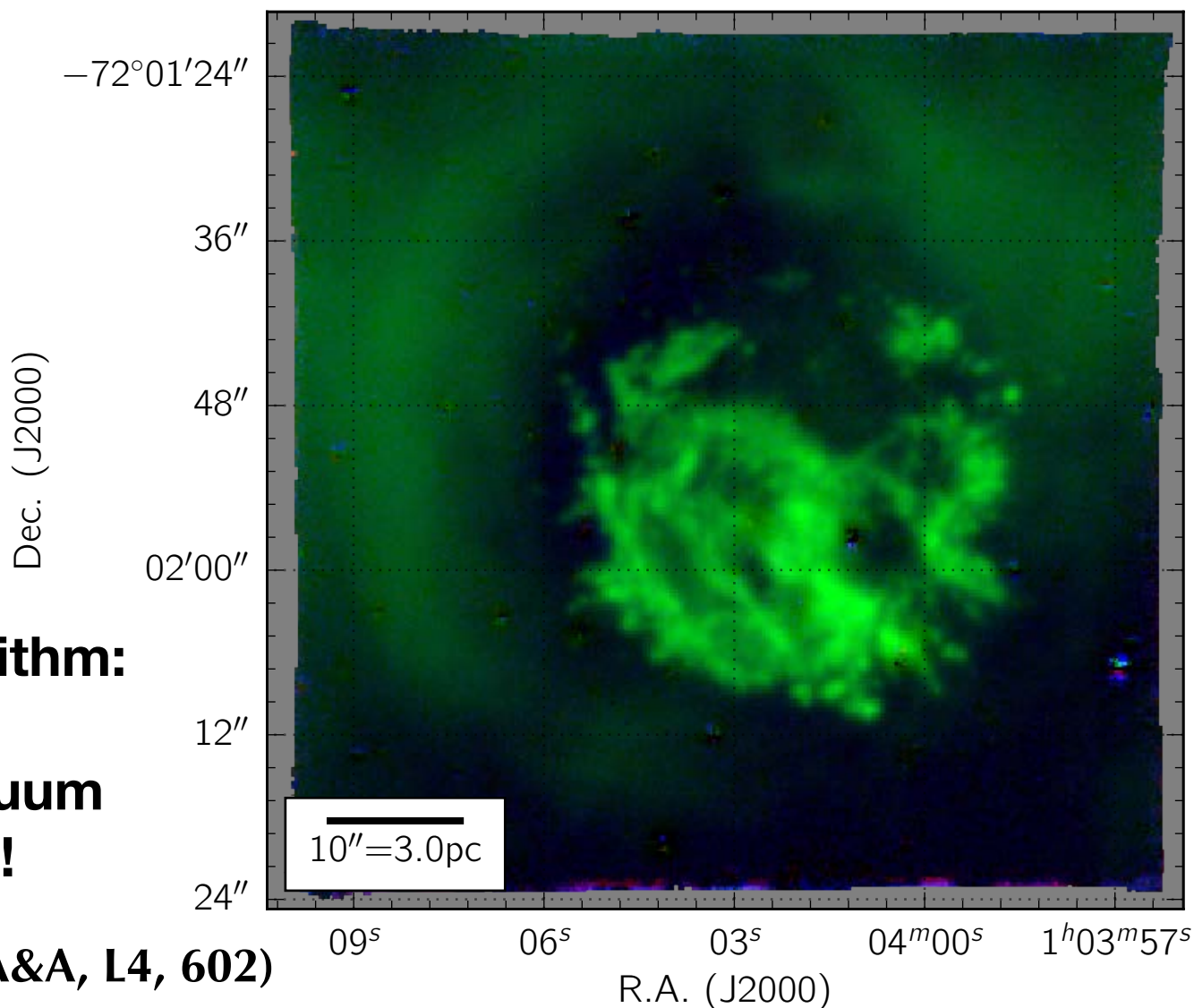
Going after Sulfur ...

LOWESS algorithm:

=> “no” continuum

=> critical step!

(see Vogt+, 2017, A&A, L4, 602)

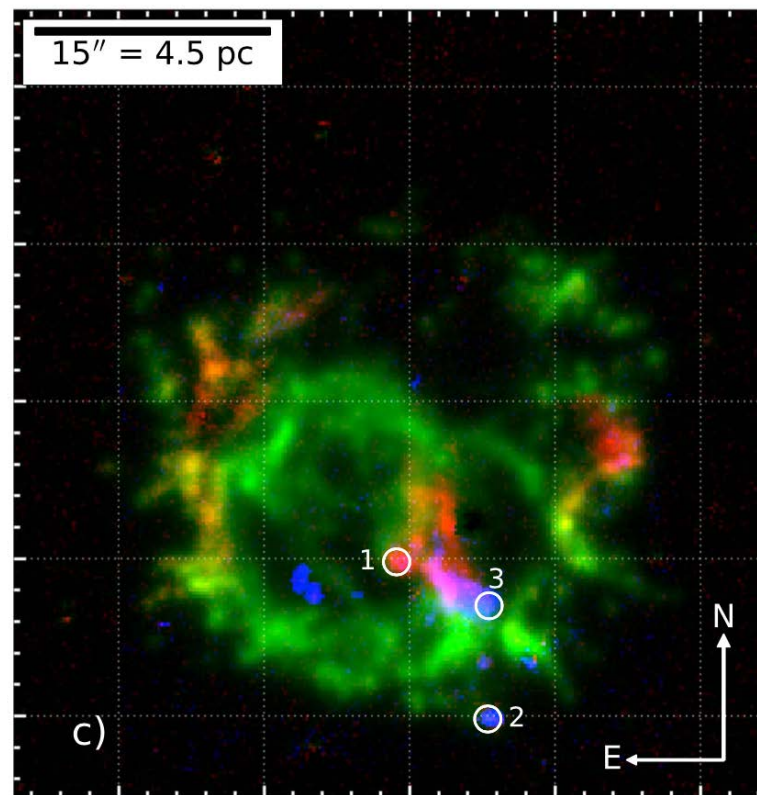


Going after Sulfur ...

[O III] [S II] Ha

+ Hb, [S III], [Ar III], [Cl II]

=> Type IIb



Seitenzahl+, 2018, ApJL, 853, L32

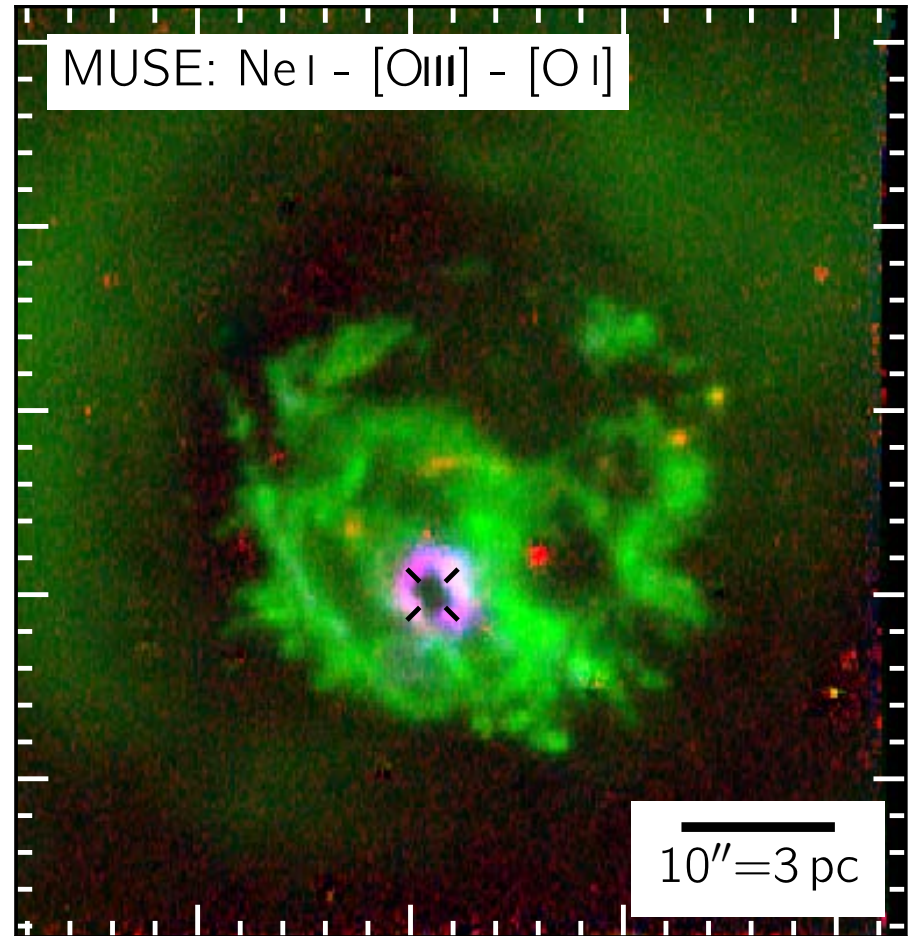
(see also Blair+, 2000; Chevalier, 2005)

No continuum = fainter stuff !

Ne I 5303Å

[O III]

O I 7774Å

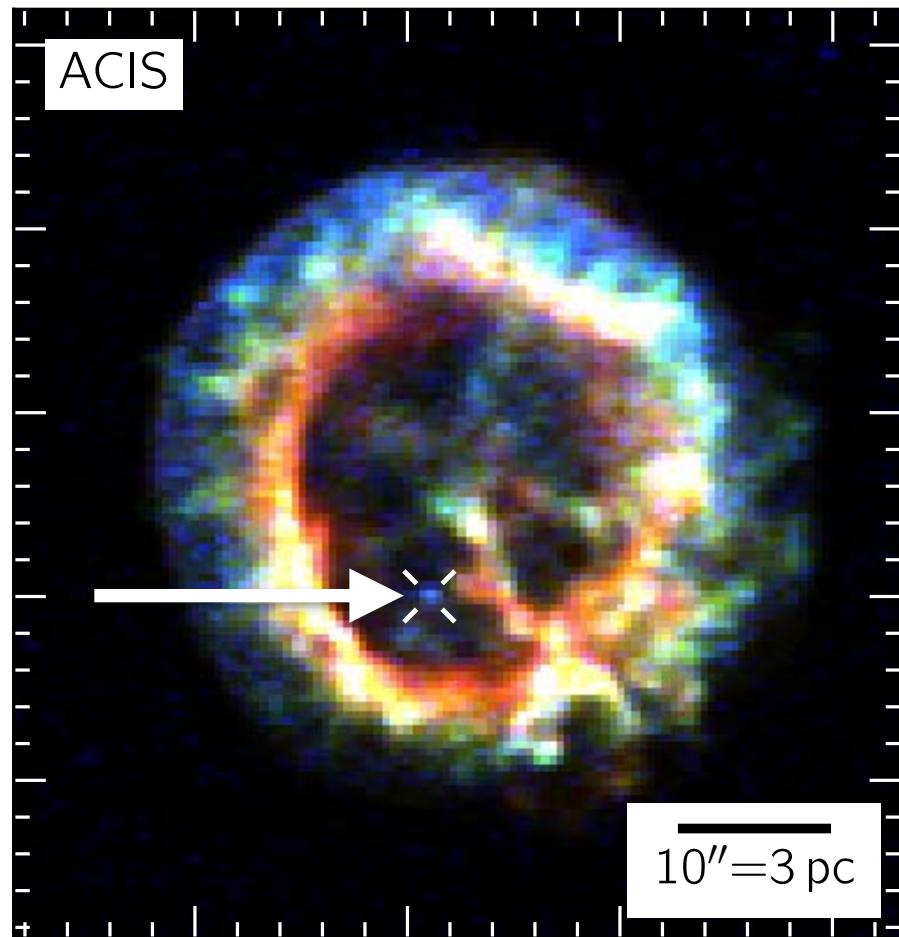


The compact object

$$L_X = (8.4 \pm 1.6) \cdot 10^{33} \text{ erg s}^{-1}$$

$$kT_{BB} = 0.19 \text{ keV}$$

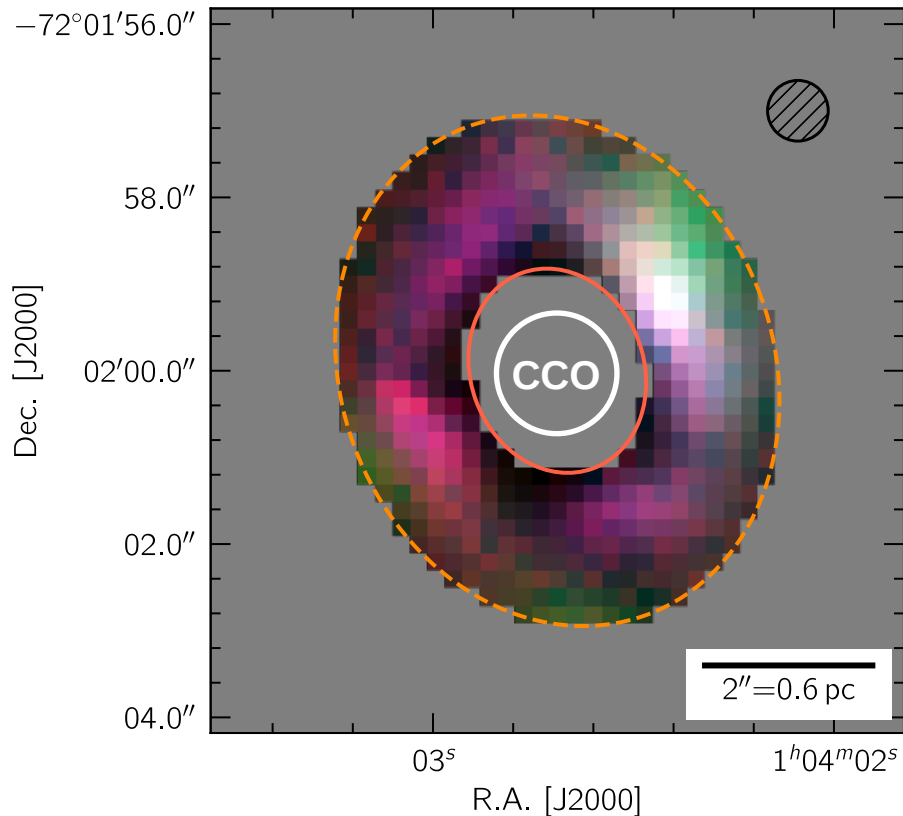
$$R = 8.7^{+4.9}_{-2.7} \text{ km}$$



Vogt+, 2018, Nature Astronomy, 2, 465
(see also Rutkowski+, 2010)

The ring: ?

MUSE: Ne I & O I



HST: [O III]



=> MUSE NFM follow-up

Other CCOs ?

**=> MUSE survey of Galactic CCOs
("Filler of the Apocalypse")**

Start with

Puppis A & Vela Jr.

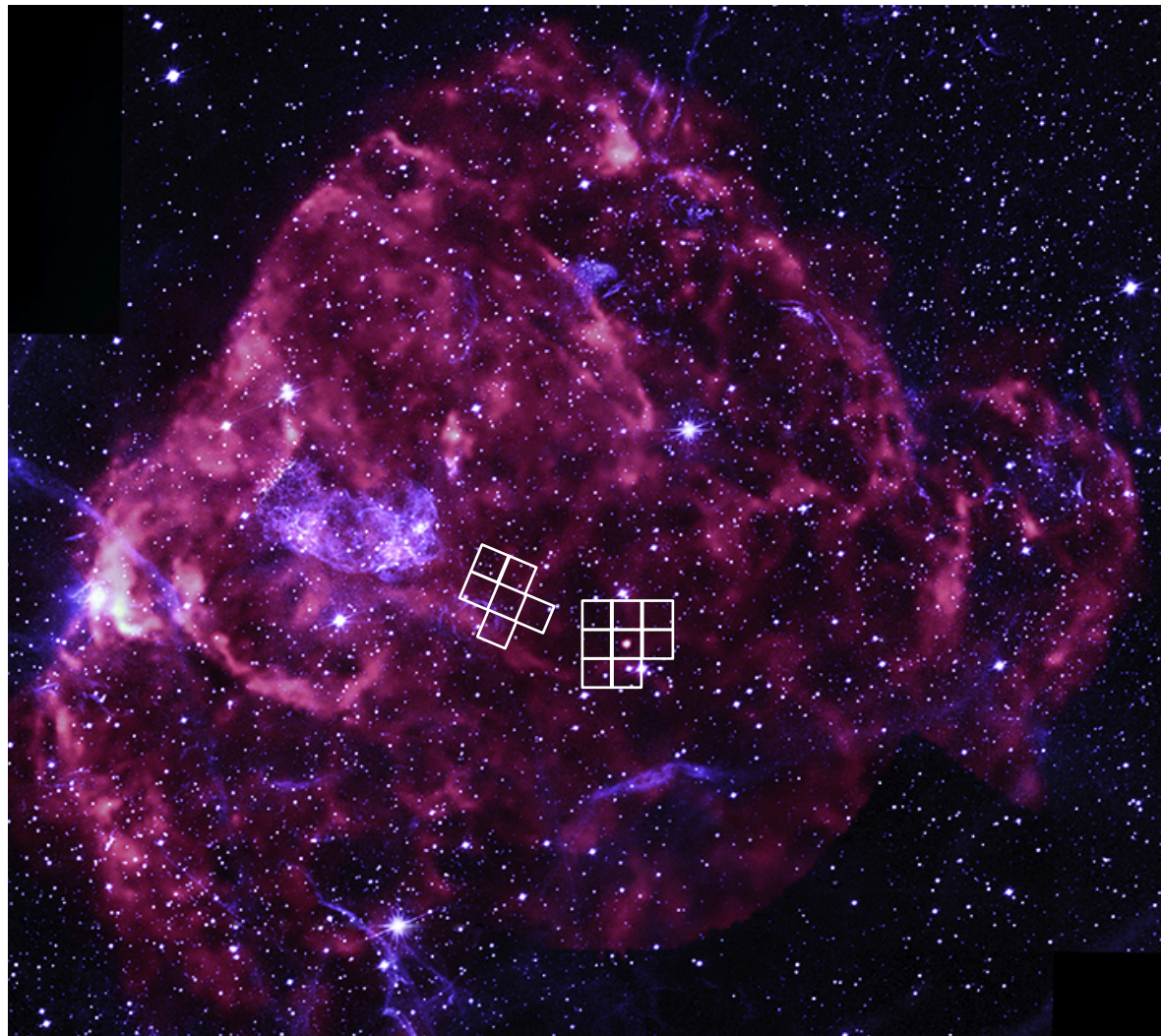
Puppis A

**2 areas surveyed:
CCO and COE**



WIP by Janette Suherli

... see also
P. Ghavamian's talk!



CCO in Vela Jr.

X-ray

Aschenbach+ (1999), Mereghetti+ (2001),
Pavlov+ (2001), ... : **identification of CCO**

Optical

Pellizzoni+ (2002):

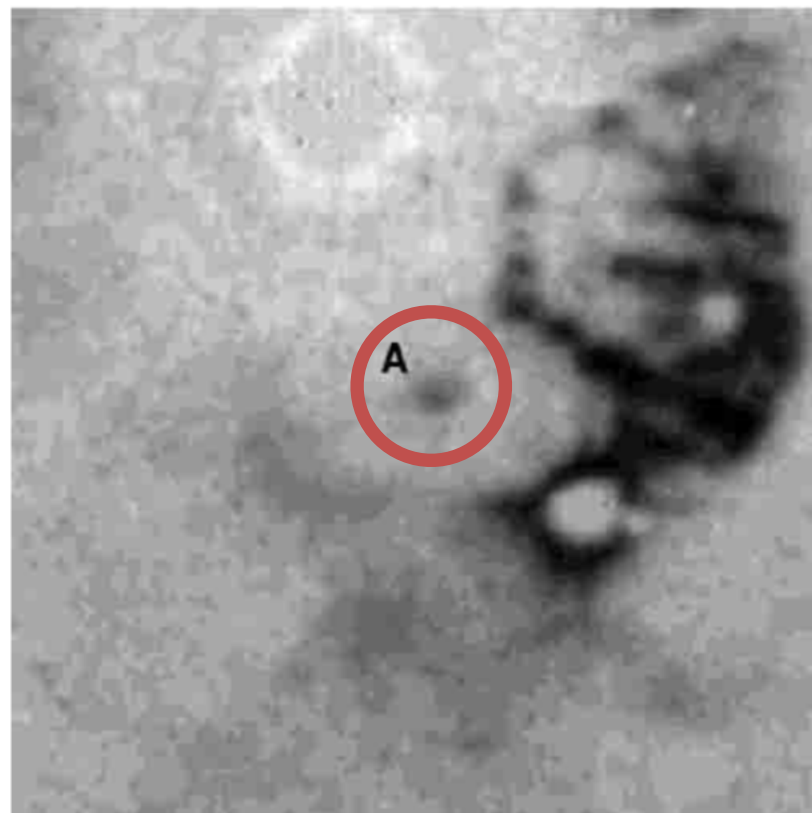
Ha (narrow band), first detection

Mignani+ (2007):

FORS1, R-band, detection

Mignani+ (2009):

HST, WFPC2 656N, non-detection ???



Pellizzoni+ (2002)

Vela Jr. CCO with MUSE

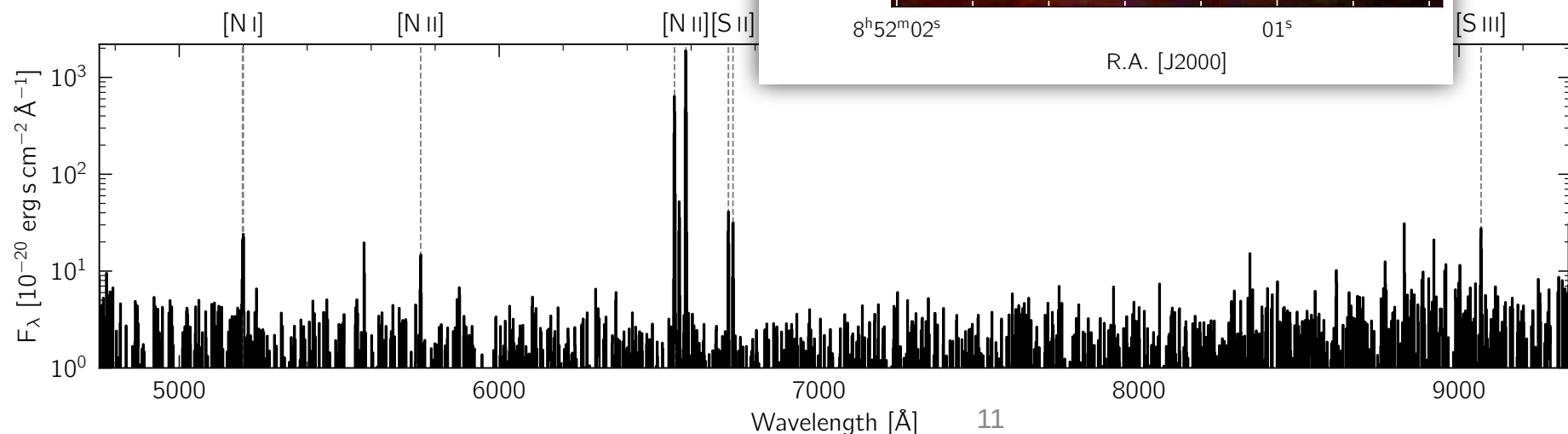
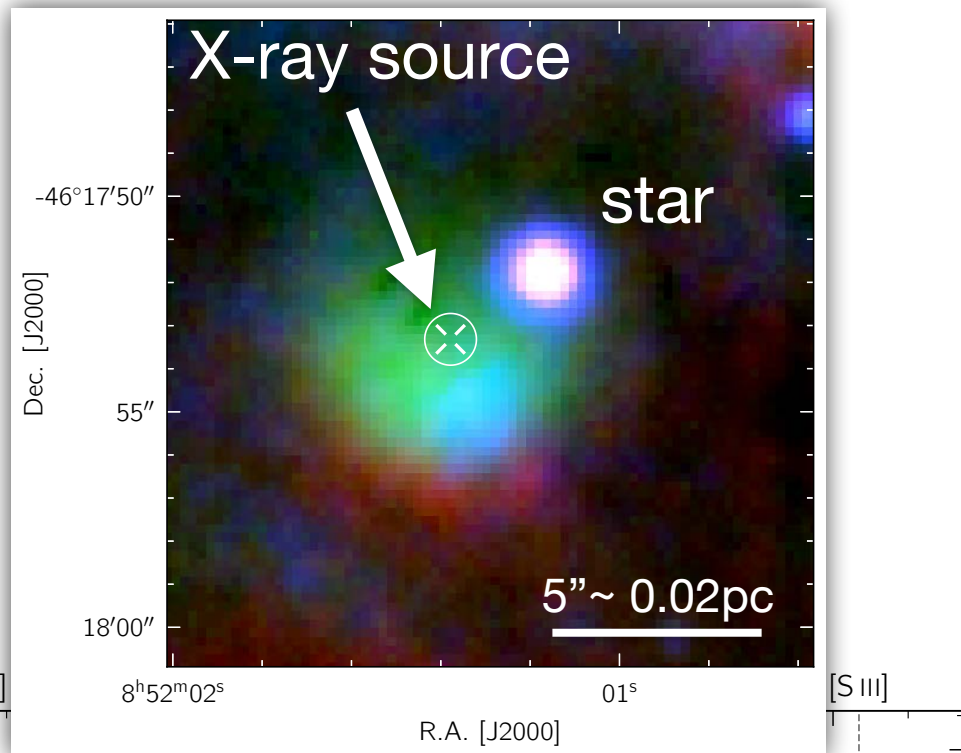
Ha **[N II]** **[S II]**

T~6000 K, $n \sim 100 \text{ cm}^{-3}$

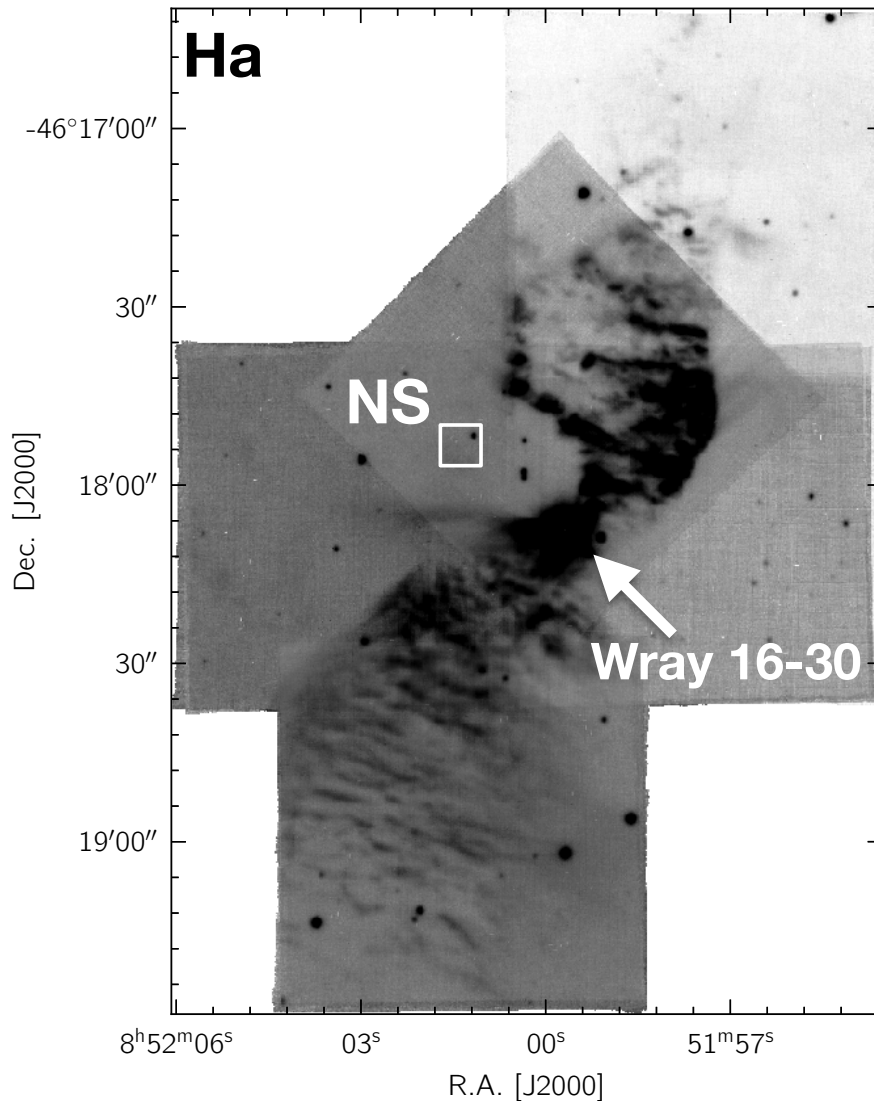
Hypothesis: X-ray nebula

Challenge: “no” Hydrogen ?

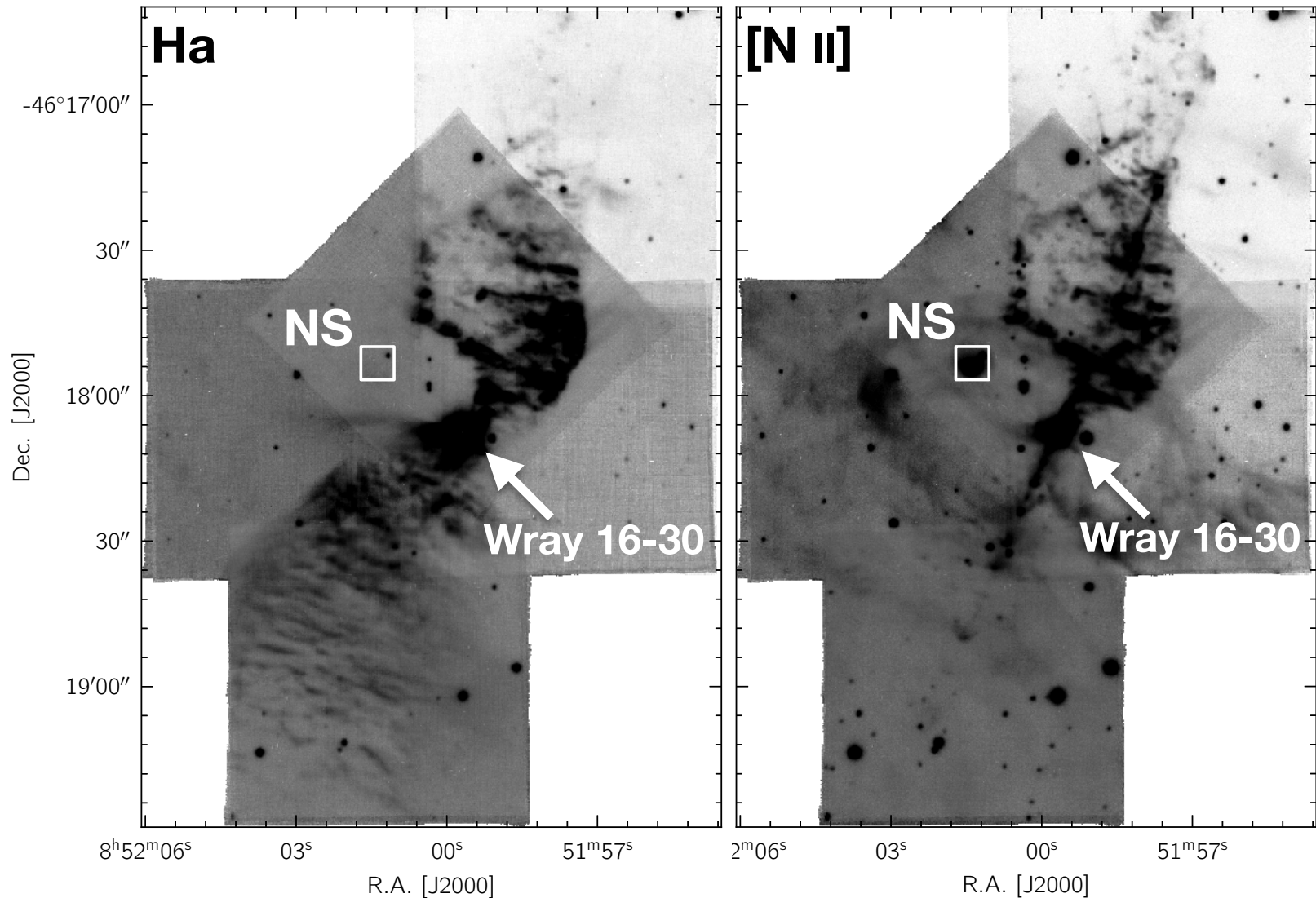
=> see van Kerkwijk and Kulkarni (2001)



Bonus: Wray 16-30 (= Ve 7-27)



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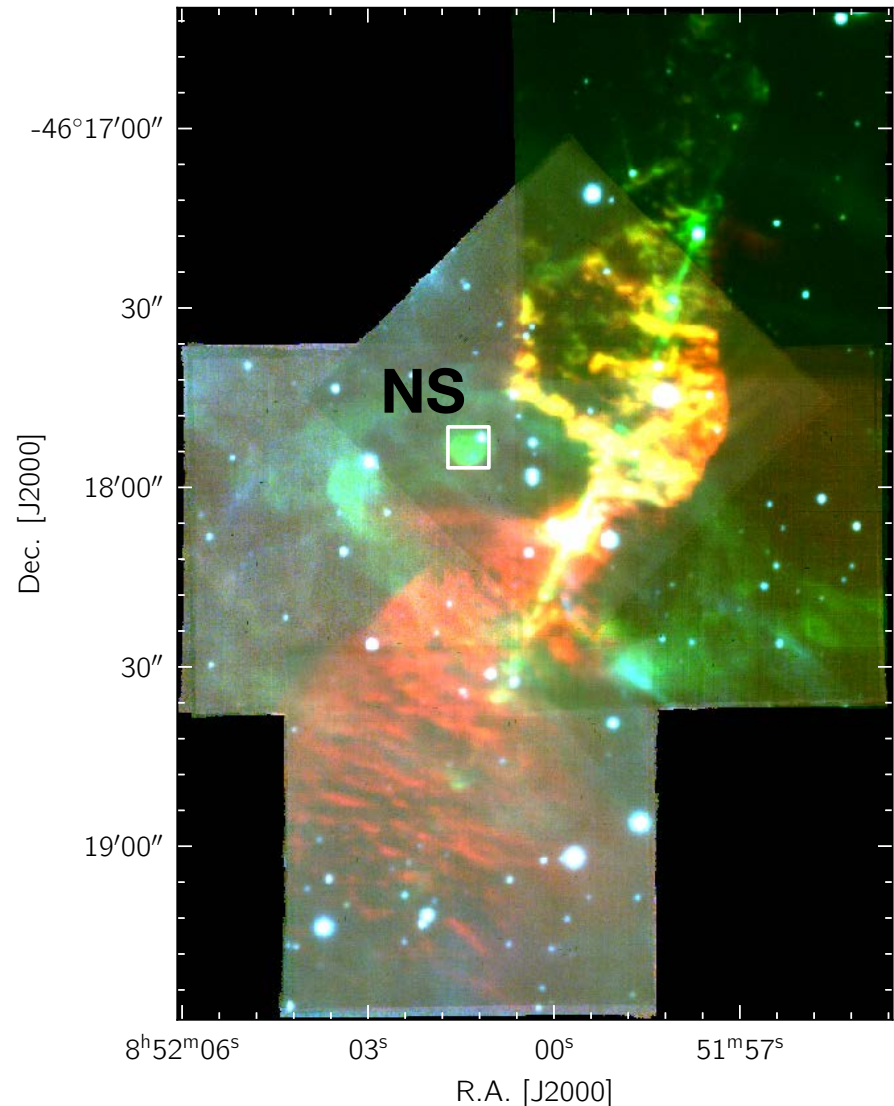


Wray 16-30 is a Class II YSO

Ha, [S II], ... envelope
[N II] jet, $v_{\text{proj}} \sim 150$ km/s
Jet length: ~ 0.5 (x2) pc

Emission line star,
double-peaked line profiles
=> see Landaberry+ (2001)

IR excess
=> see Allen & Swings (1976)



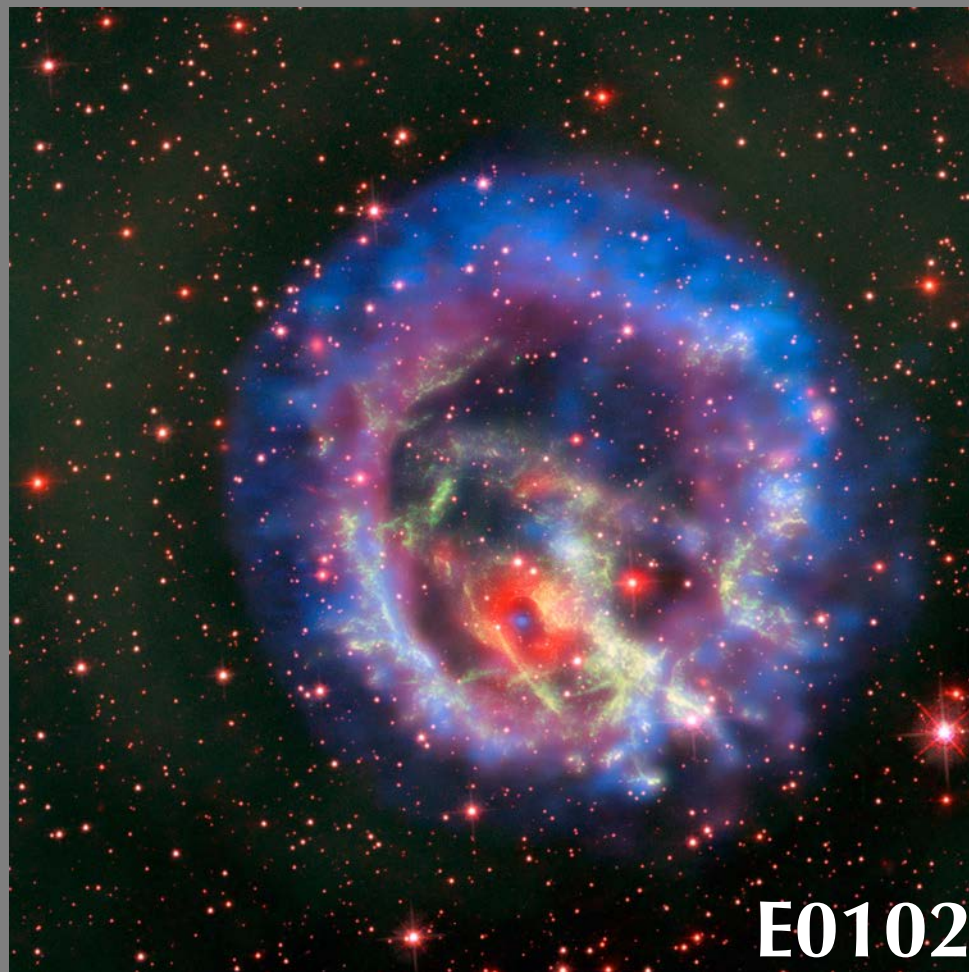
What comes next ...

1) Nebulae in E0102 & Vela Jr.
=> new constraints for CCOs

2) Other CCOs
=> other constraints ?

3) IFS for SNRs
=> what else could be lying in
the shadows ?

**=> Session 5 for more
optical IFS fun!**



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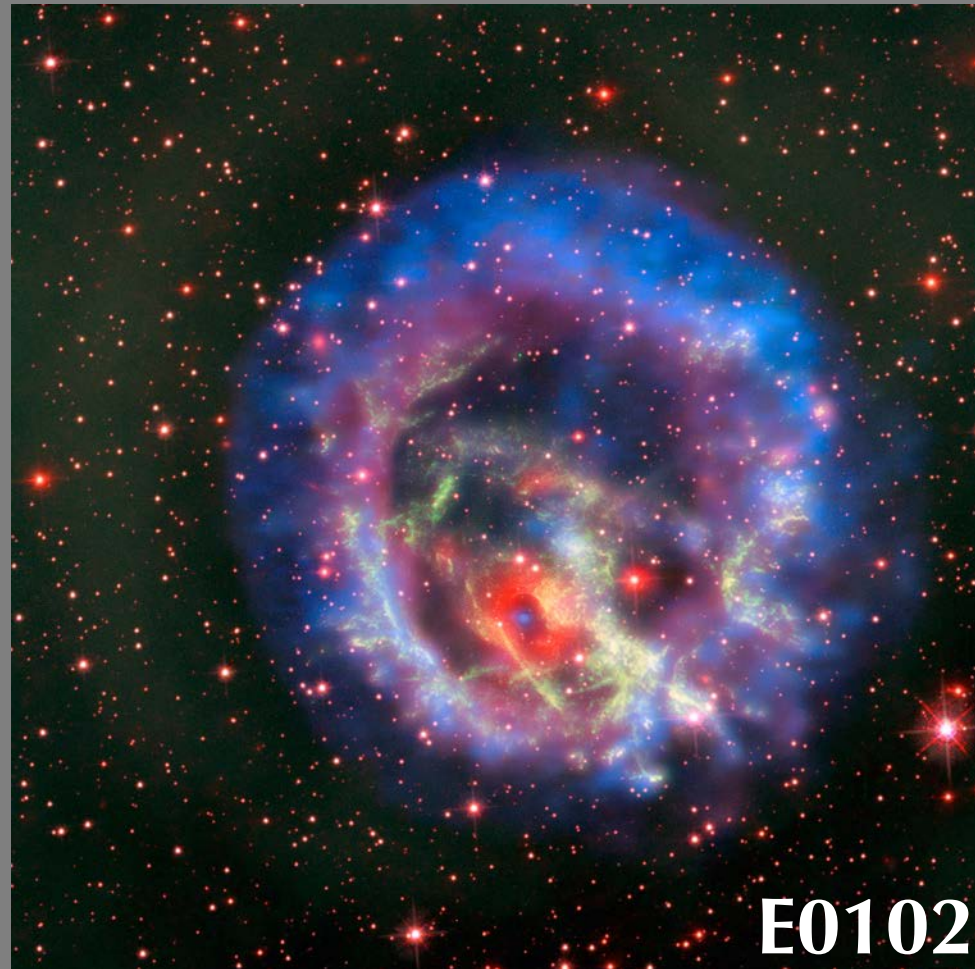
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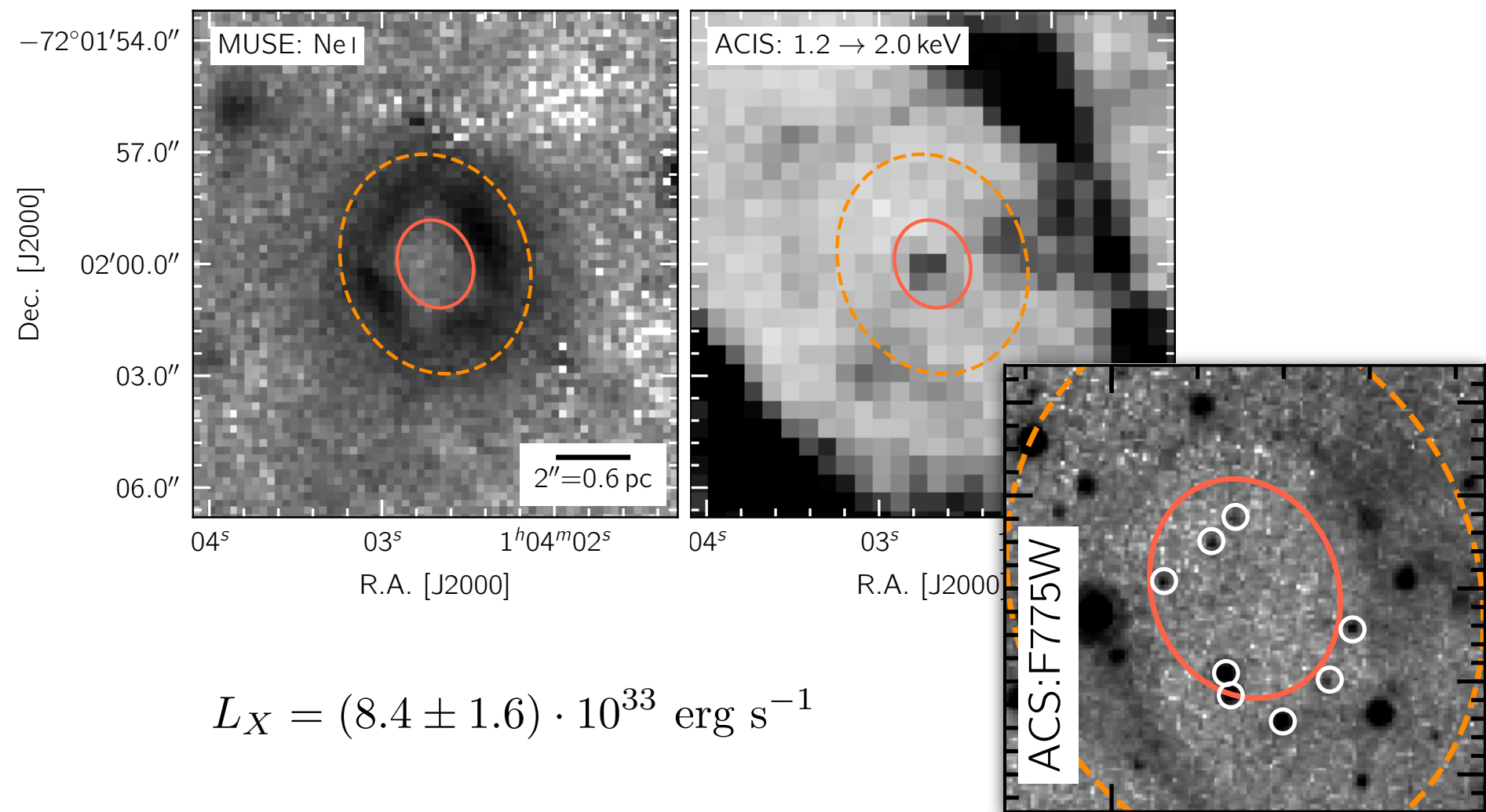
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Zooming-in ...



What is this ?

A Central Compact Object (CCO):

- inside SNR
- no optical counterpart
- $L_X = (8.4 \pm 1.6) \cdot 10^{33} \text{ erg s}^{-1}$

$$kT_{BB} = 0.19 \text{ keV}$$

$$R = 8.7_{-2.7}^{+4.9} \text{ km}$$

