Supergiants and AGB stars at high angular resolution

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photo: S. Guisard

RSGs and AGBs

- Red supergiants and asymptotic giant branch stars experience intense mass loss
- Extraction of material from the star, formation of molecules and dust are complex
- High angular resolution techniques now resolve the key spatial scales for nearby stars
- Examples of recent results on Betelgeuse and L_2 Pup (+ see other presentations !)

Betelgeuse

Wind acceleration

0.025 arcsec | 0.25 arcsec | 2.5 arcsec | 4 arcmin

Photosphere

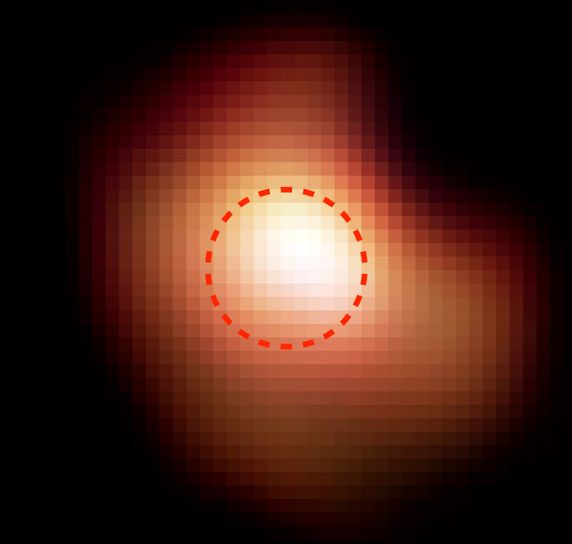
Internal envelope 1-10 R_*

Intermediate envelope 10-100 R_*

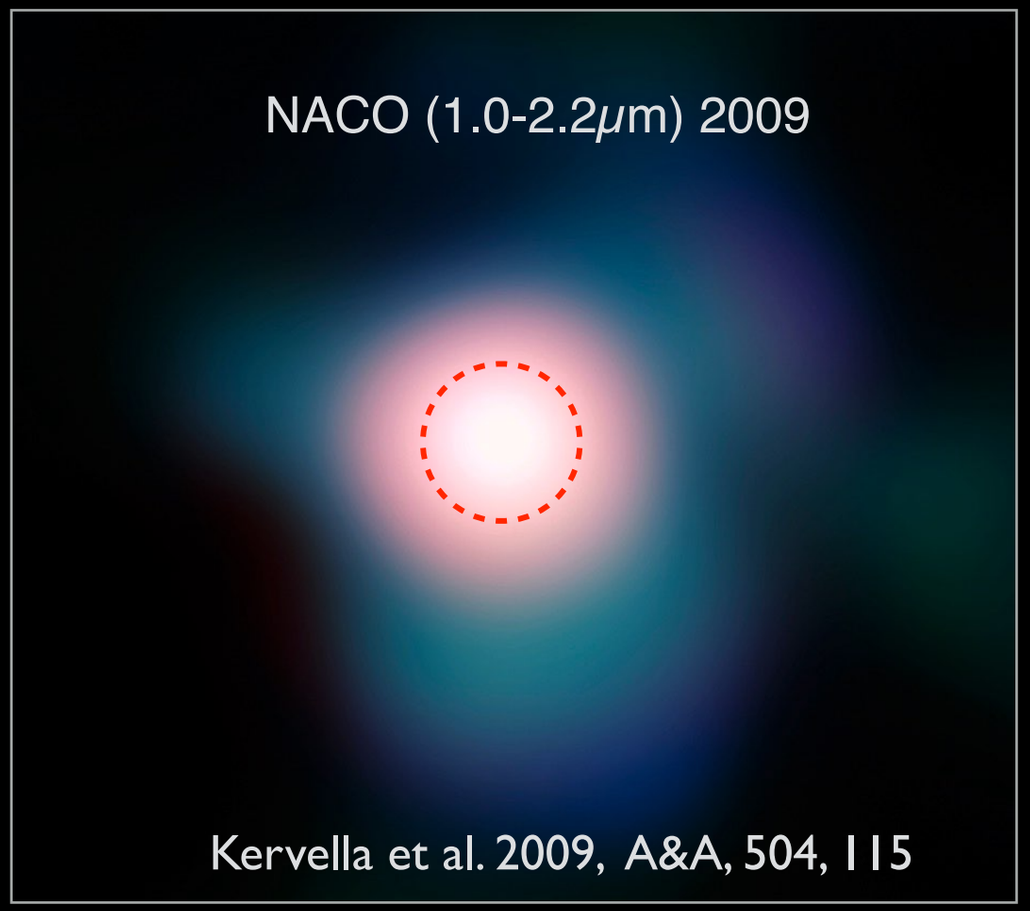
External envelope 100-10^4 R_*

MIS

ZIMPOL (0.5-0.7μm) 2015

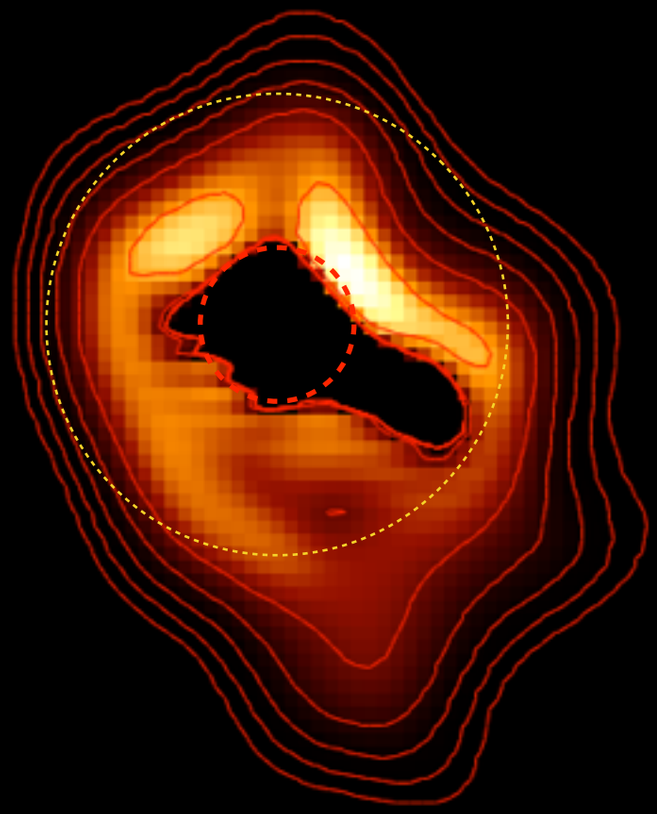


NACO (1.0-2.2μm) 2009

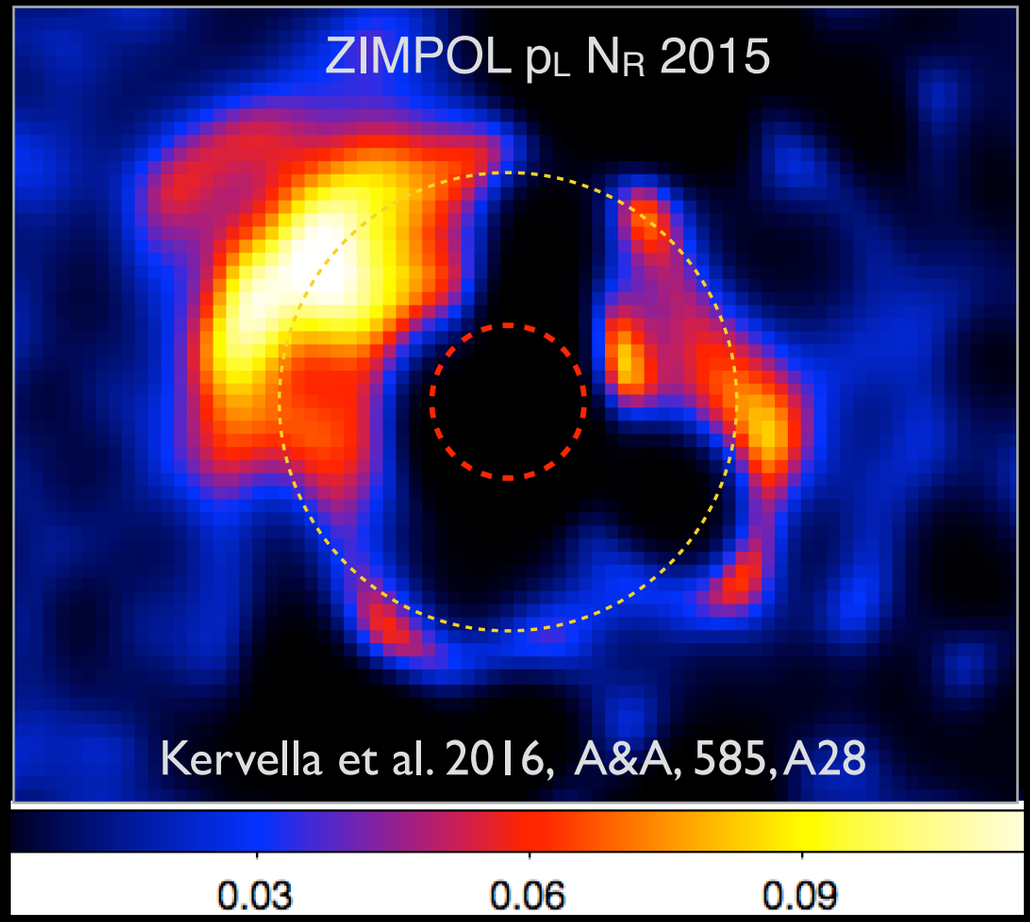


Kervella et al. 2009, A&A, 504, 115

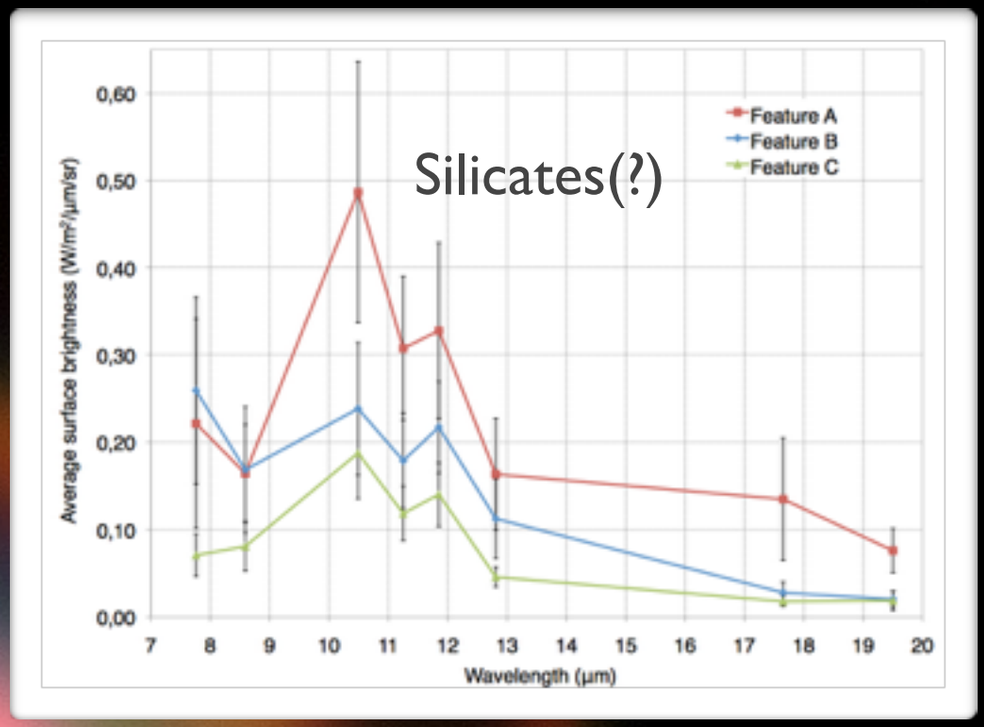
ZIMPOL Hα 2015



ZIMPOL p_L N_R 2015



Kervella et al. 2016, A&A, 585, A28



40 km/s

10 km/s

Dust shell

A

1”

VISIR (2011)
8 - 20 µm

Kervella et al. 2011, A&A, 531, A117

L2 Puppis

- M5III, SRa (Mira-like) star with P=141d
- Mass : from 0.7 Msun (Lykou et al. 2015) up to 2 Msun (Kervella et al. 2014)
- Suspected binary star from Hipparcos astrometric wobble)
- Second nearest AGB star (64 ± 4 pc, m_V~5) after R Doradus (~55 pc)
- Long term, slow dimming event ongoing since 15 years (Bedding et al. 2002)

2.17 μm

b. NACO speckle + AMBER

Ohnaka et al. 2015 A&A, submitted

N

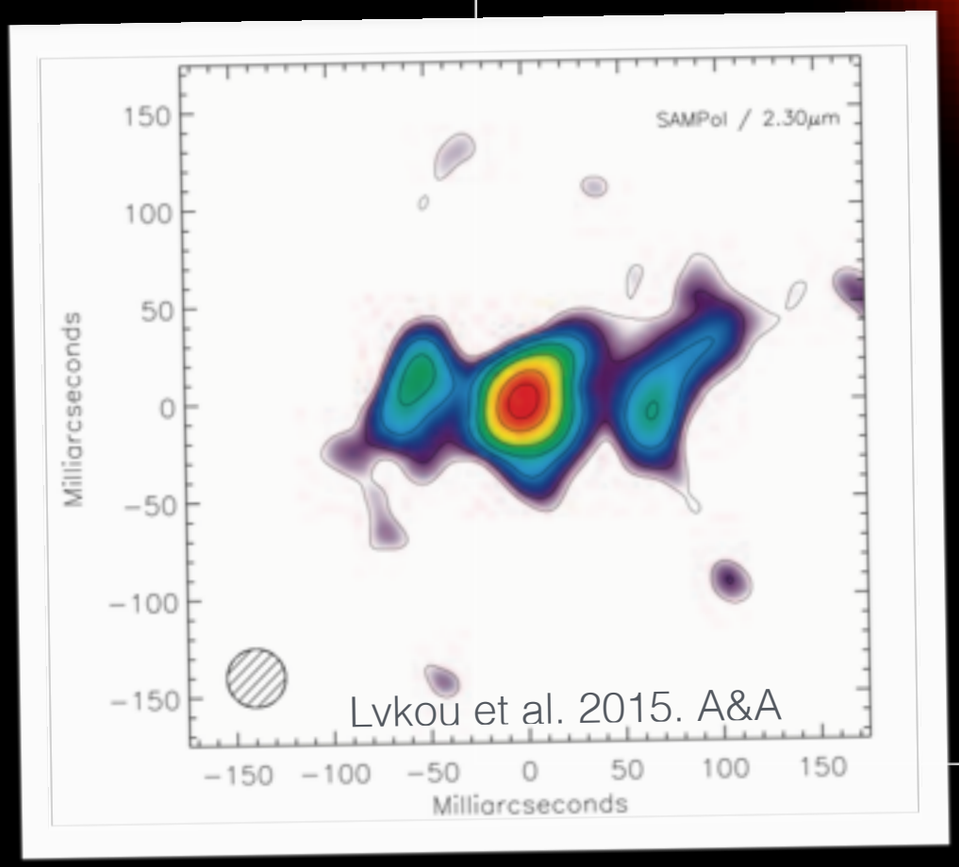
1 AU

Beam

E

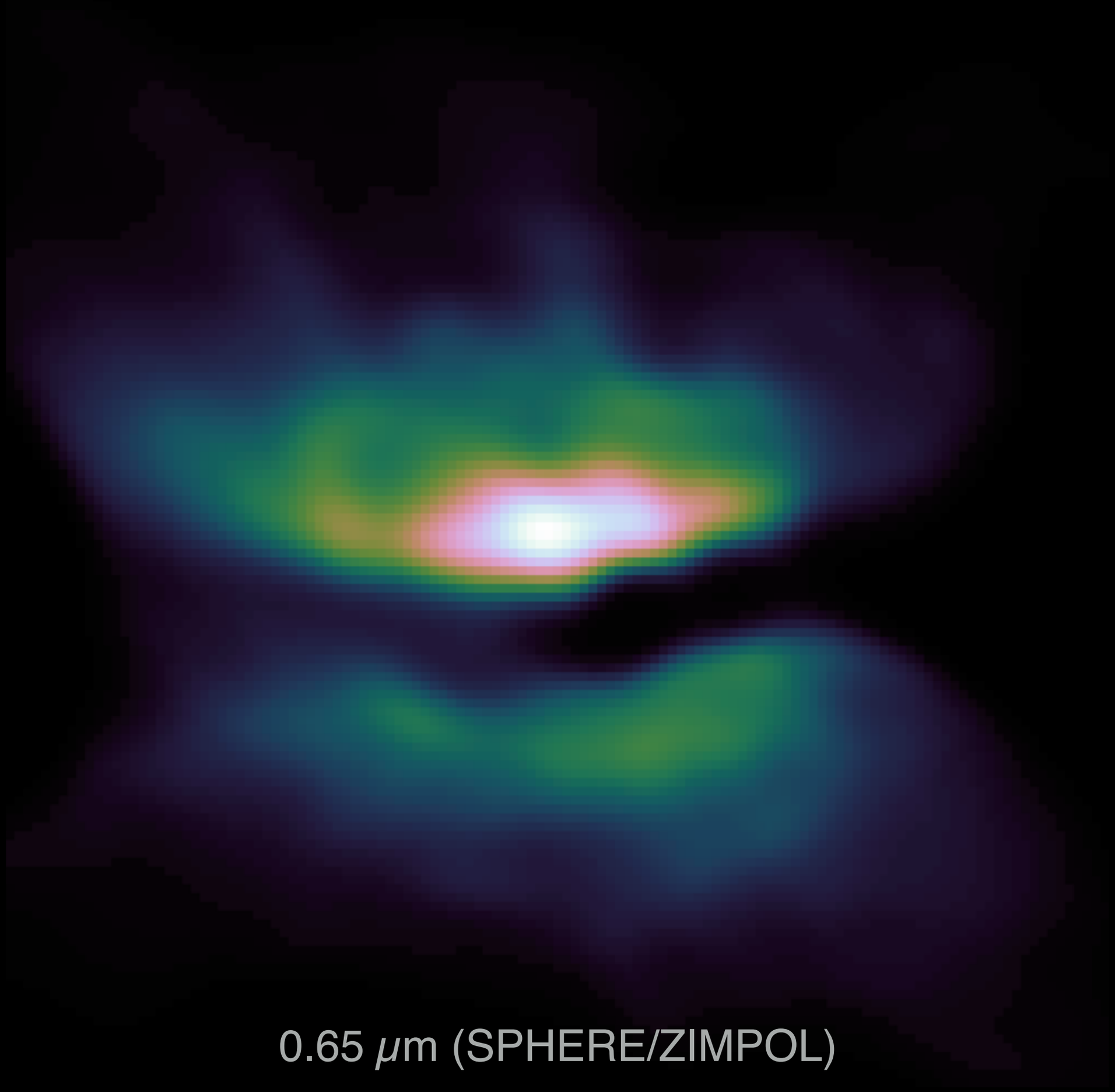
00

VLTI/VINCI

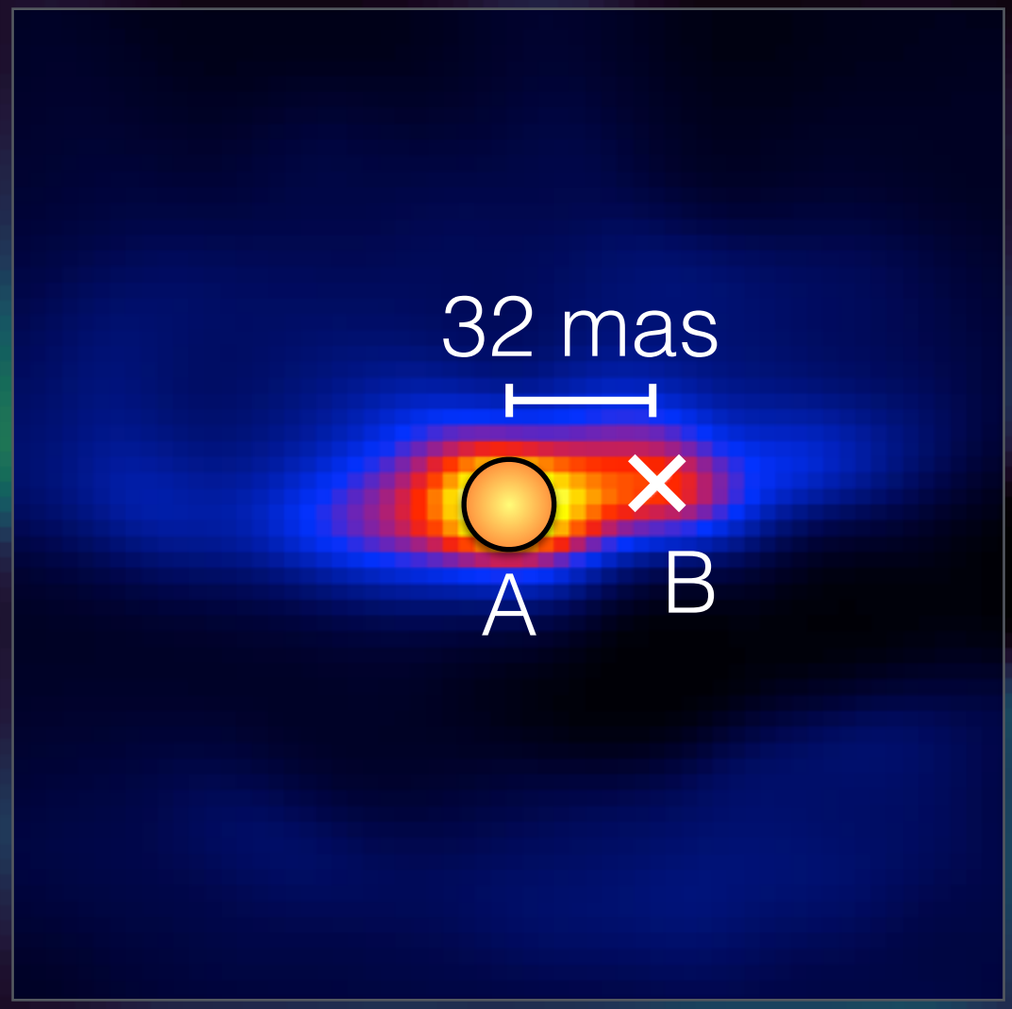


Lykou et al. 2015. A&A

Kervella et al. 2014, A&A, 564, A88

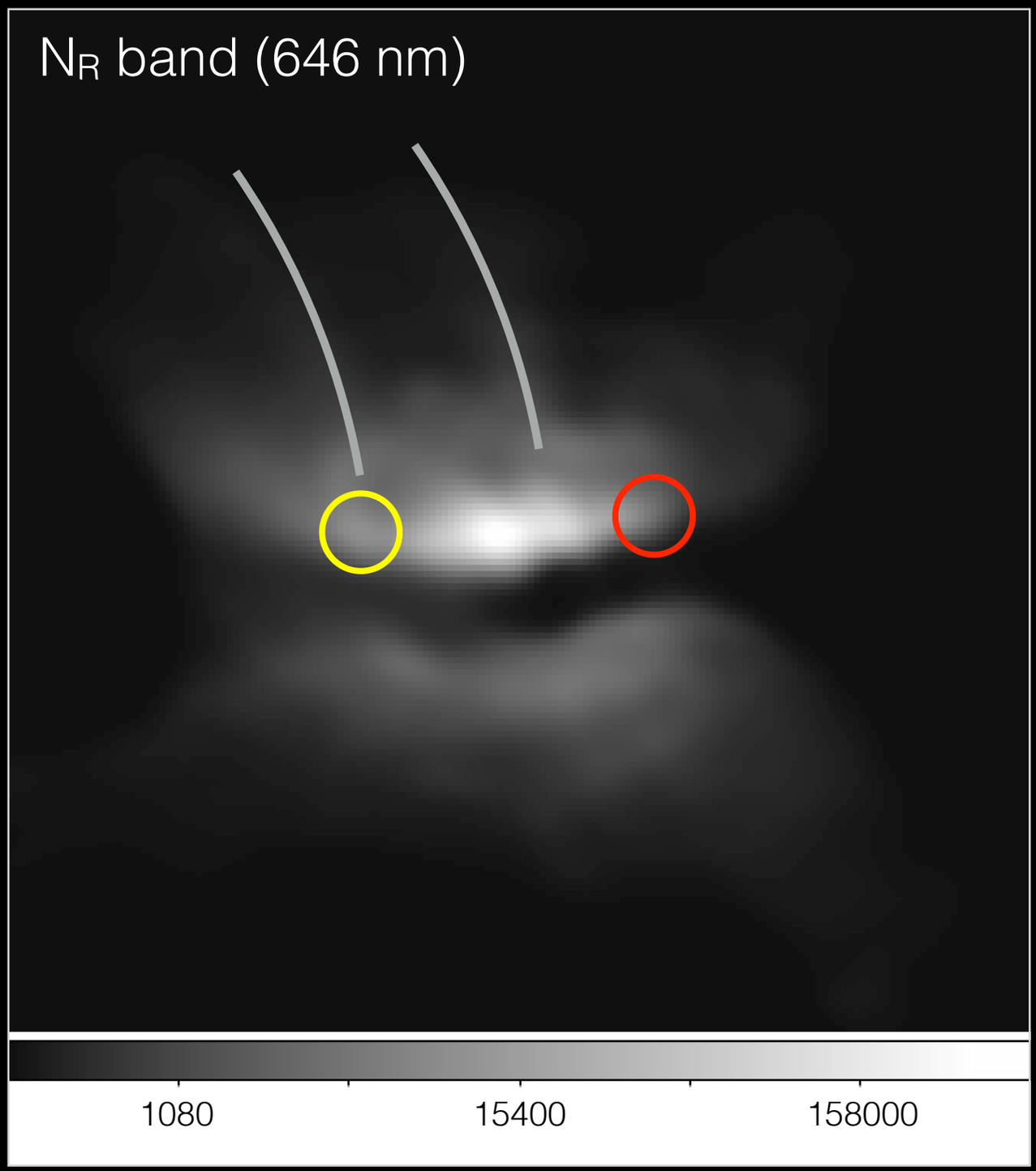


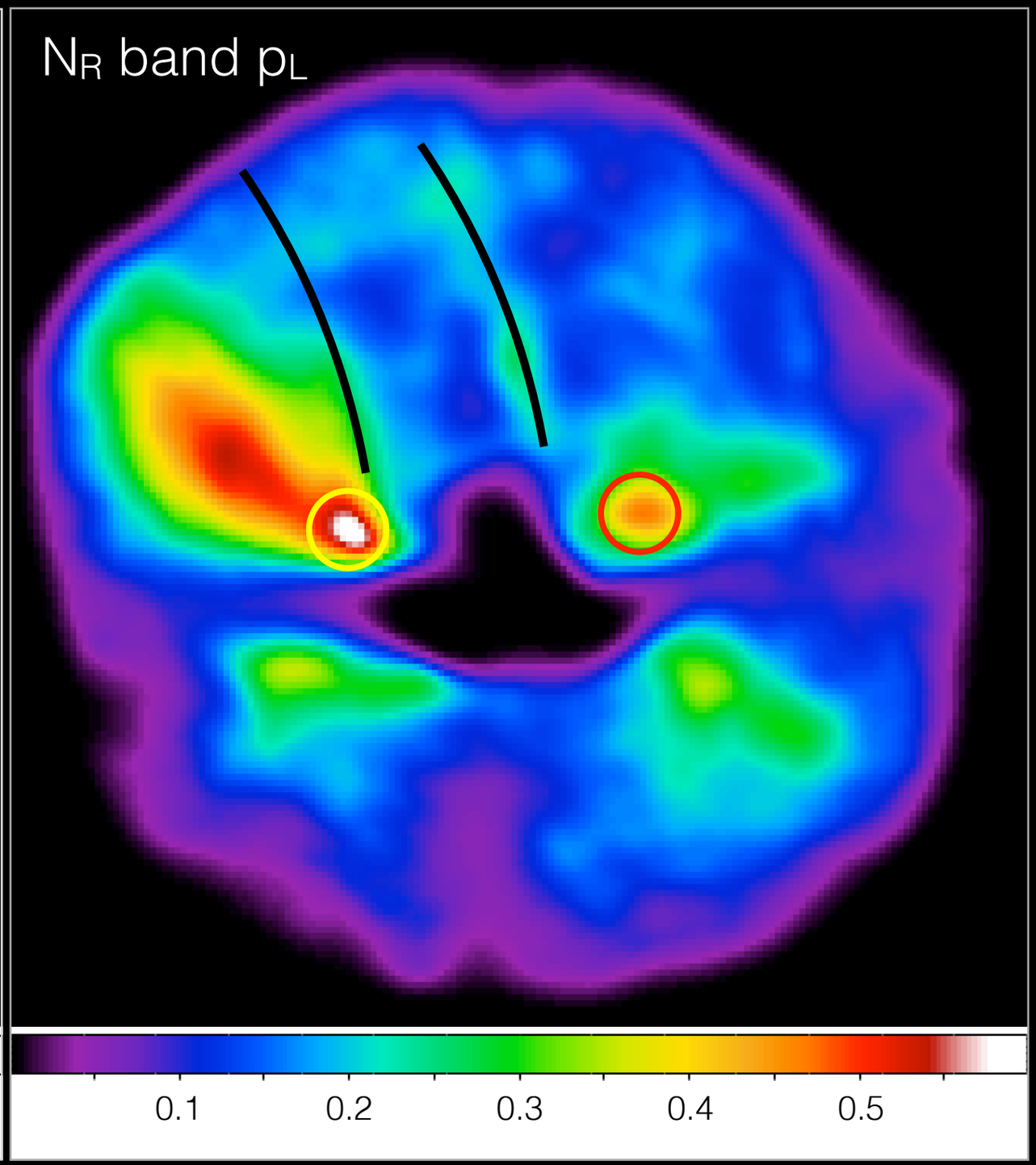
0.65 μm (SPHERE/ZIMPOL)



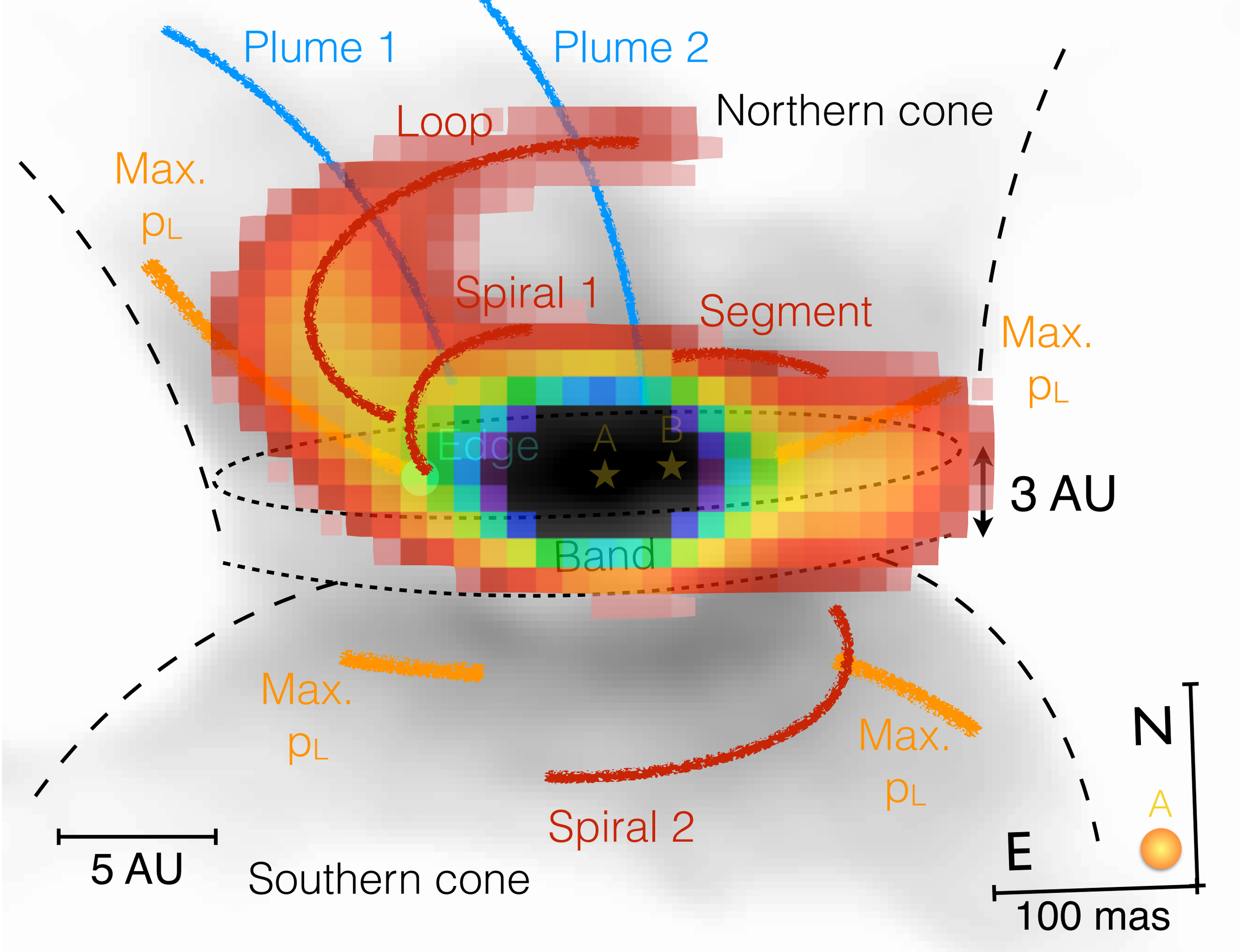
Kervella et al. 2015, A&A, 578, A77

Degree of linear polarization

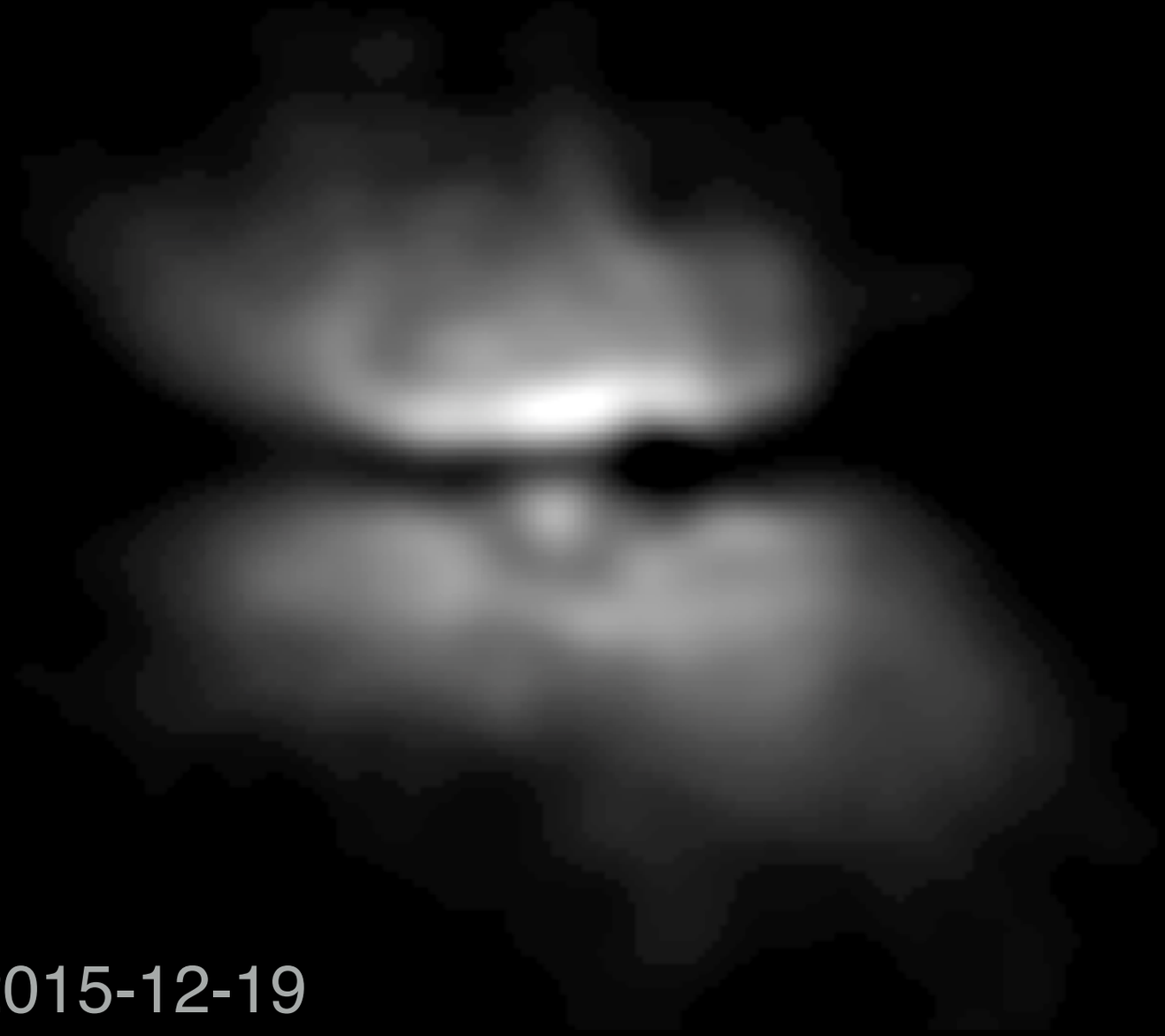




Kervella et al. 2015, A&A, 578, A77


Plume 1
Plume 2
Northern cone
Loop
Max.
pL
Spiral 1
Segment
Max.
pL
Edge
A
B
Band
3 AU
Max.
pL
Max.
pL
Spiral 2
5 AU
Southern cone
N
A
E
100 mas

L2 Pup evolution



2015-12-19

0.1”

- What creates the plumes ?
- How does the AGB wind interact with the disk ?
- How do the streamers form ?
- What is the nature of the companion ? Is it real ?