# Weighing a High Mass Protostellar Candidate: Physics and Kinematics of the M 17 Disk and its associated $H_2$ Jet

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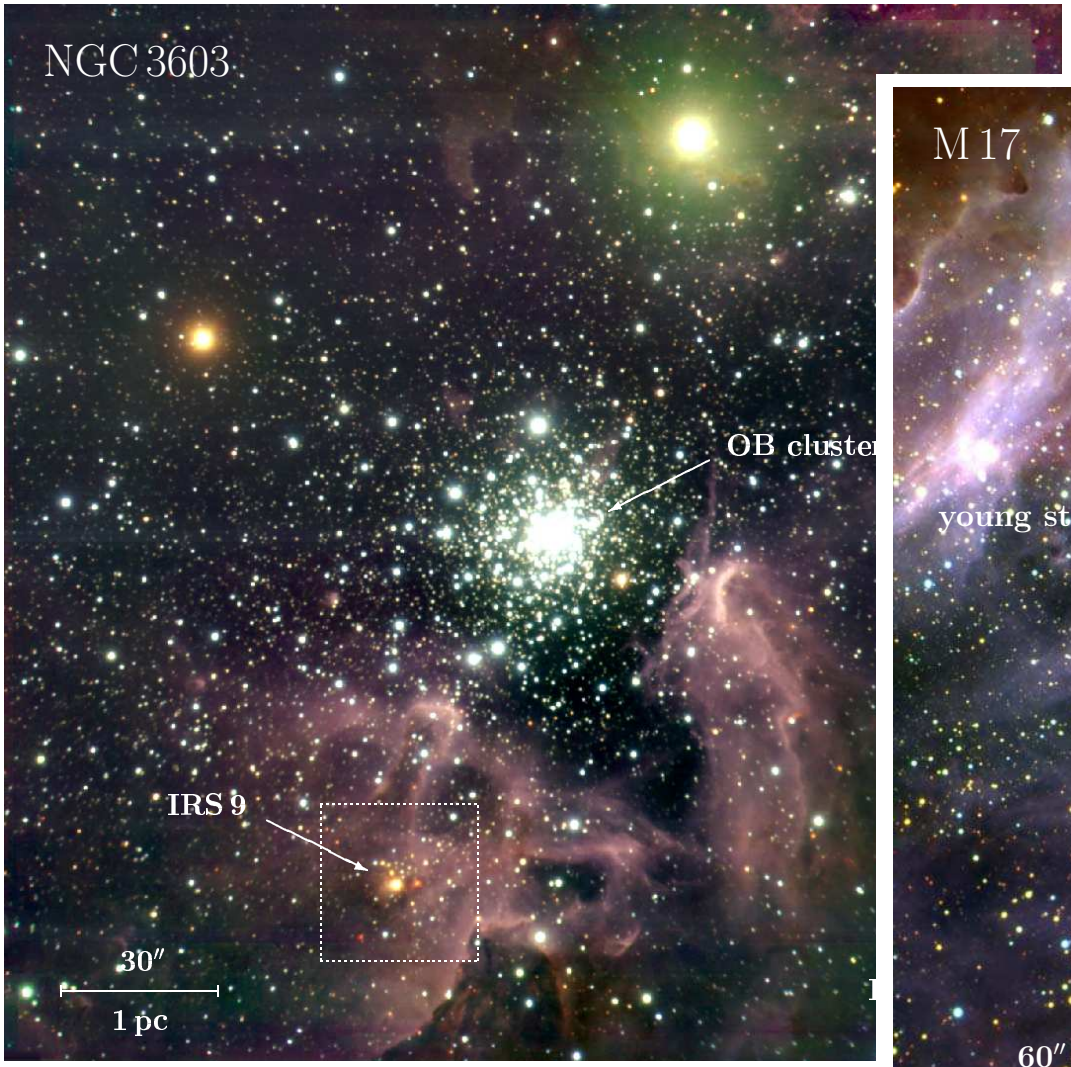
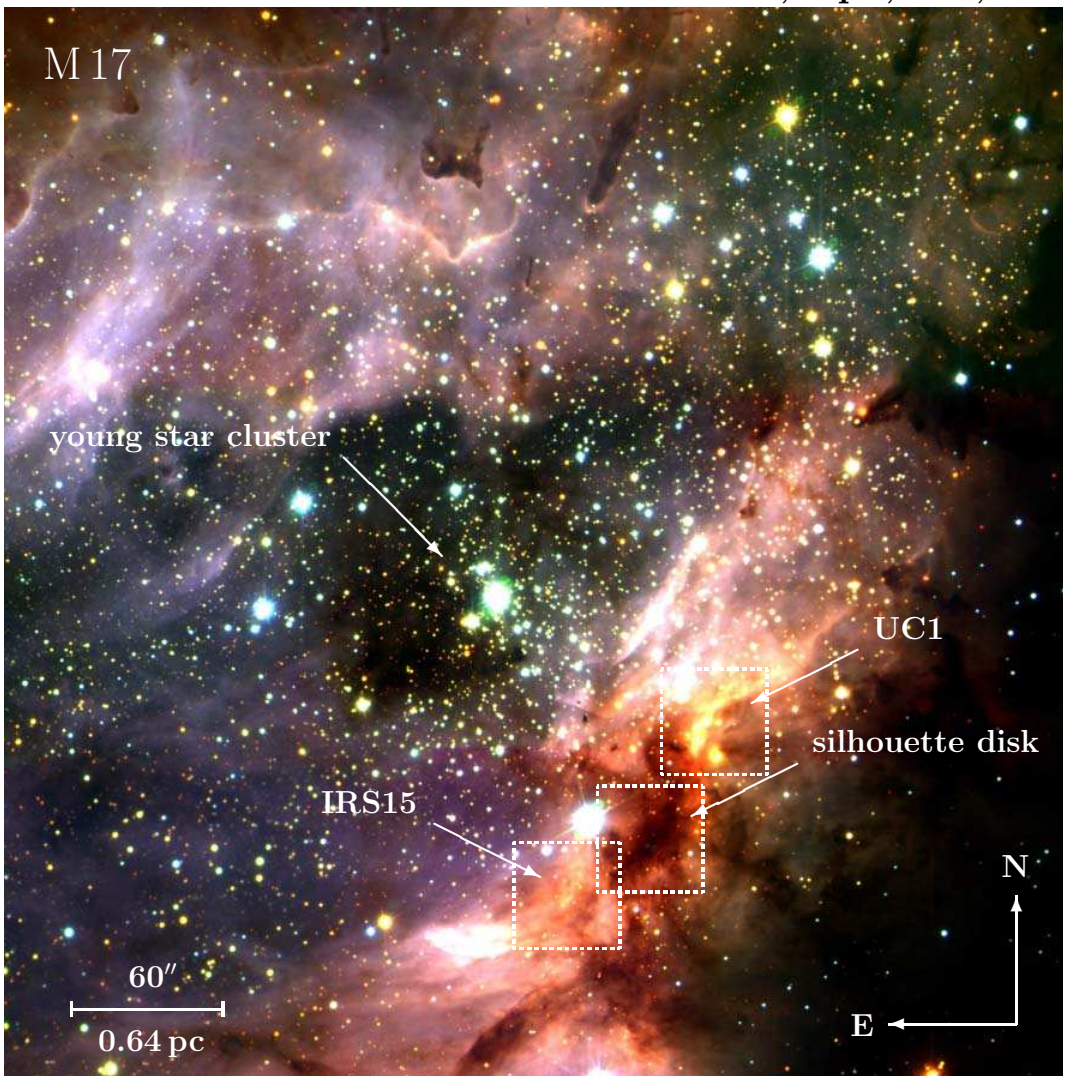
# Lifting the Curtains at the High Mass End of Star Formation Research

Chini et al. 2004, Nature, 429, 155
Chini et al. 2006, ApJ, 645, L61
Nielbock et al. 2007, ApJ, 656, L81



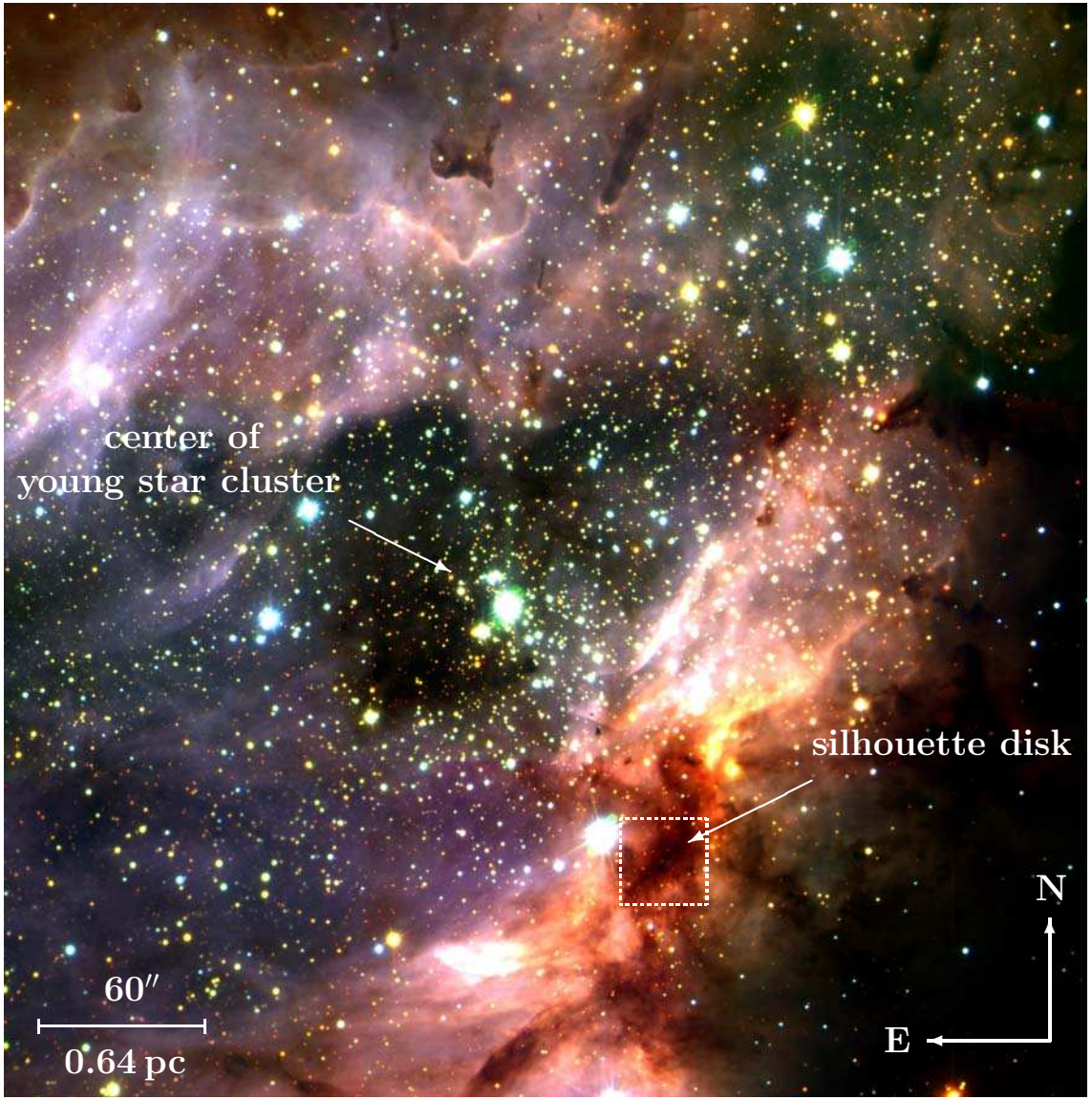

Nürnberger 2003, A&A, 404, 255
Nürnberger 2008, JoPh CS, 131, 012025

# A Huge, Flared Accretion Disk around a High Mass Protostar in M 17

$D \sim 2.2\,\mathrm{kpc}$

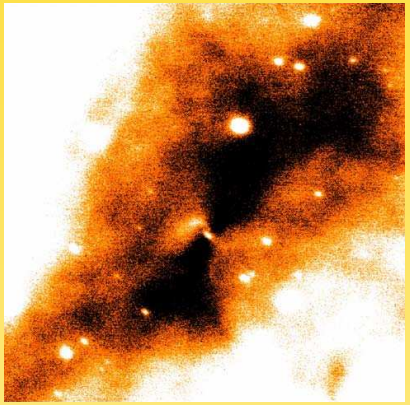
$A_V \sim 3\,\mathrm{mag}$

plus $\gtrsim 50\,\mathrm{mag}$




Chini et al. 2004

NACO, $K_s$



FOV $\sim 30'' \times 30''$

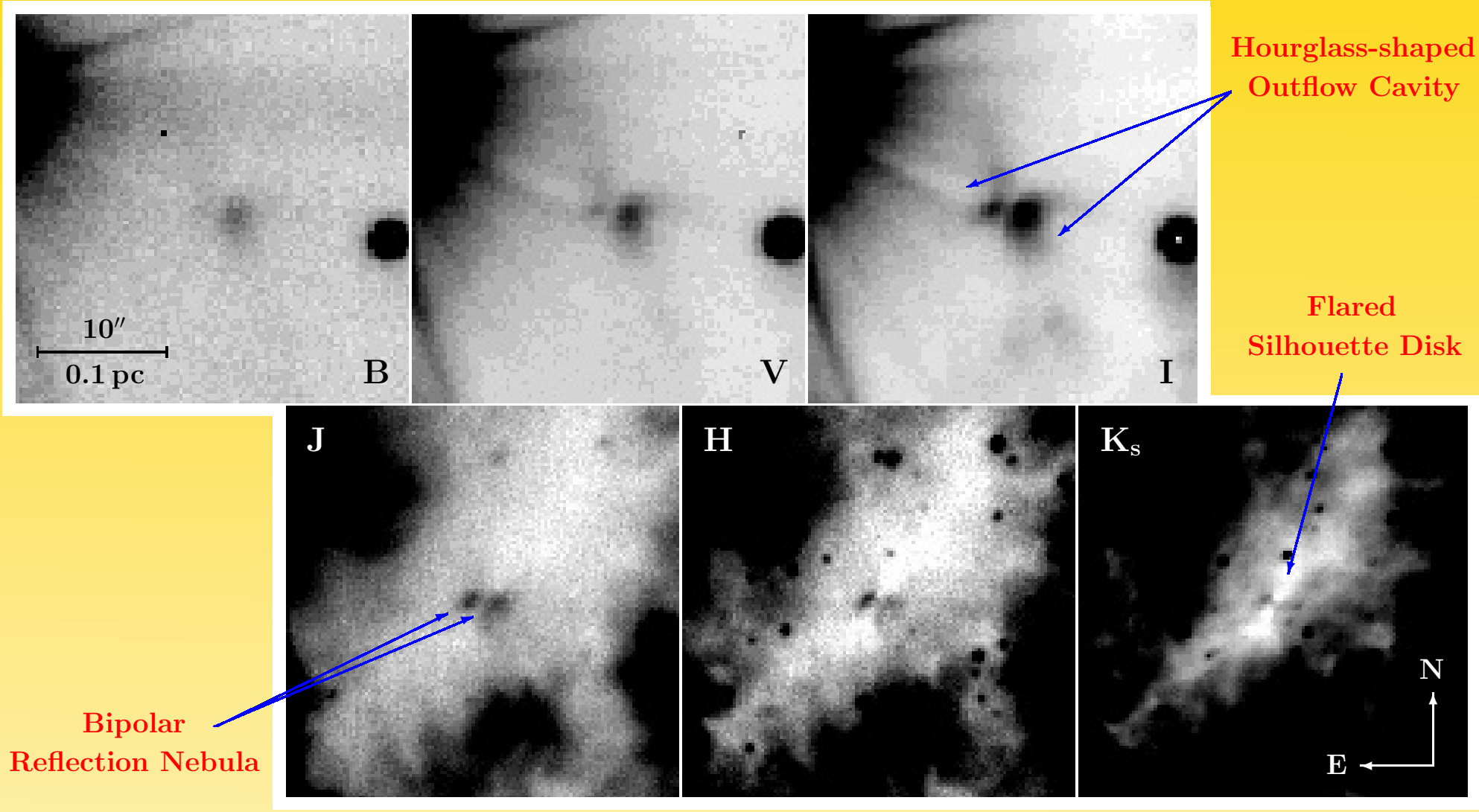
JHK$_s$

ISAAC

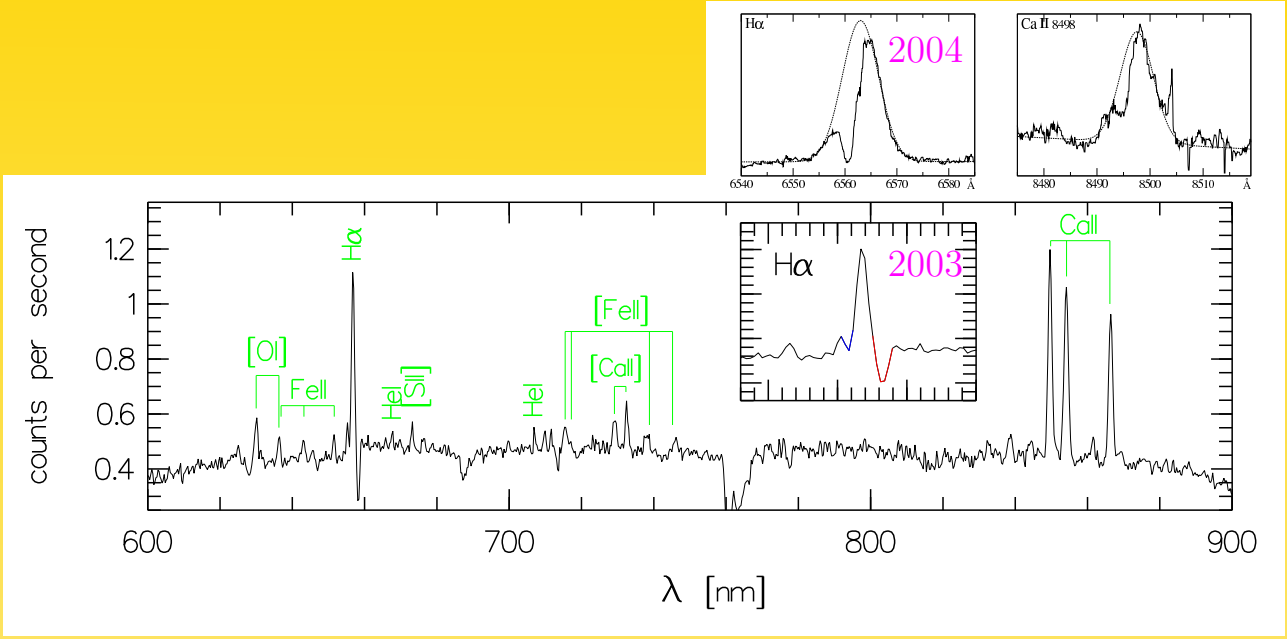
VLT Antu

FOV $\sim 7' \times 7'$

# Huge, Flared Accretion Disk and Hourglass-Shaped Outflow Cavity around a High Mass Protostar in M 17



# Optical Spectroscopy of the Bipolar Reflection Nebula




time-variable

H$\alpha$ (inverse P Cygni),

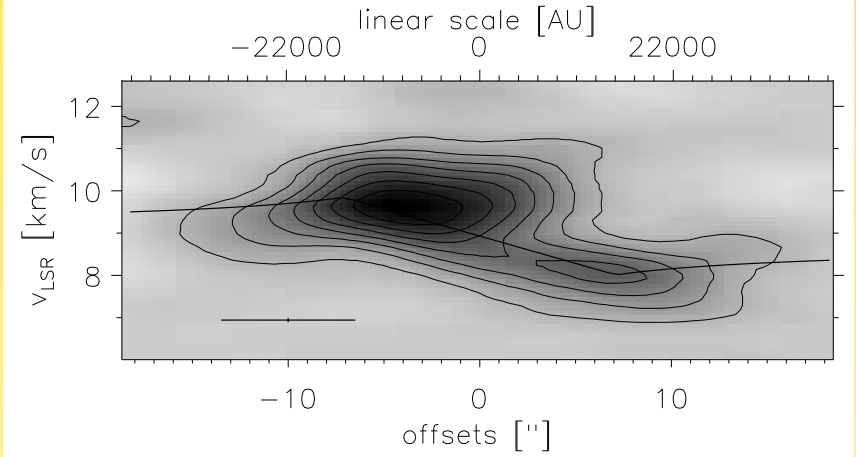
Ca II triplet and He I

$\Longrightarrow$ **Ongoing Accretion**

[Fe II], [Ca II] and [S II] lines

$\Longrightarrow$ **Ongoing Outflow Activity**

# Position – Velocity Diagram of the Molecular Gas inside the Disk

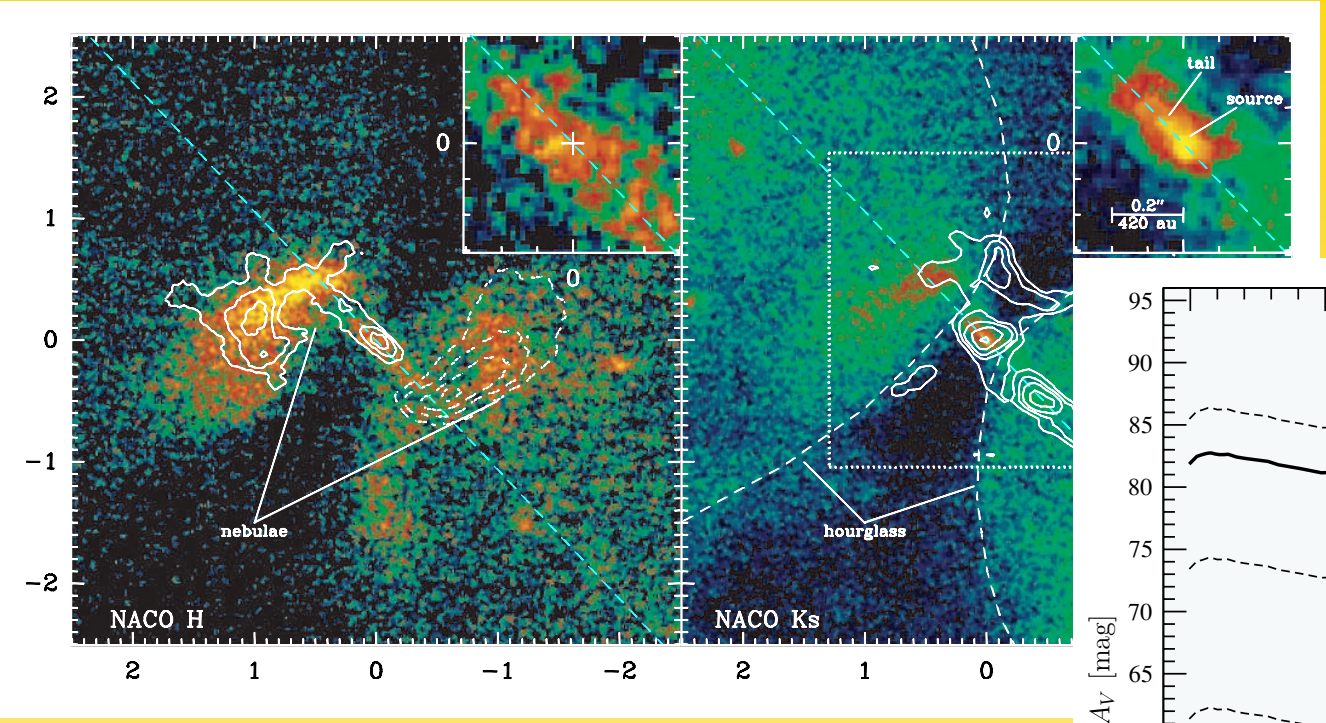


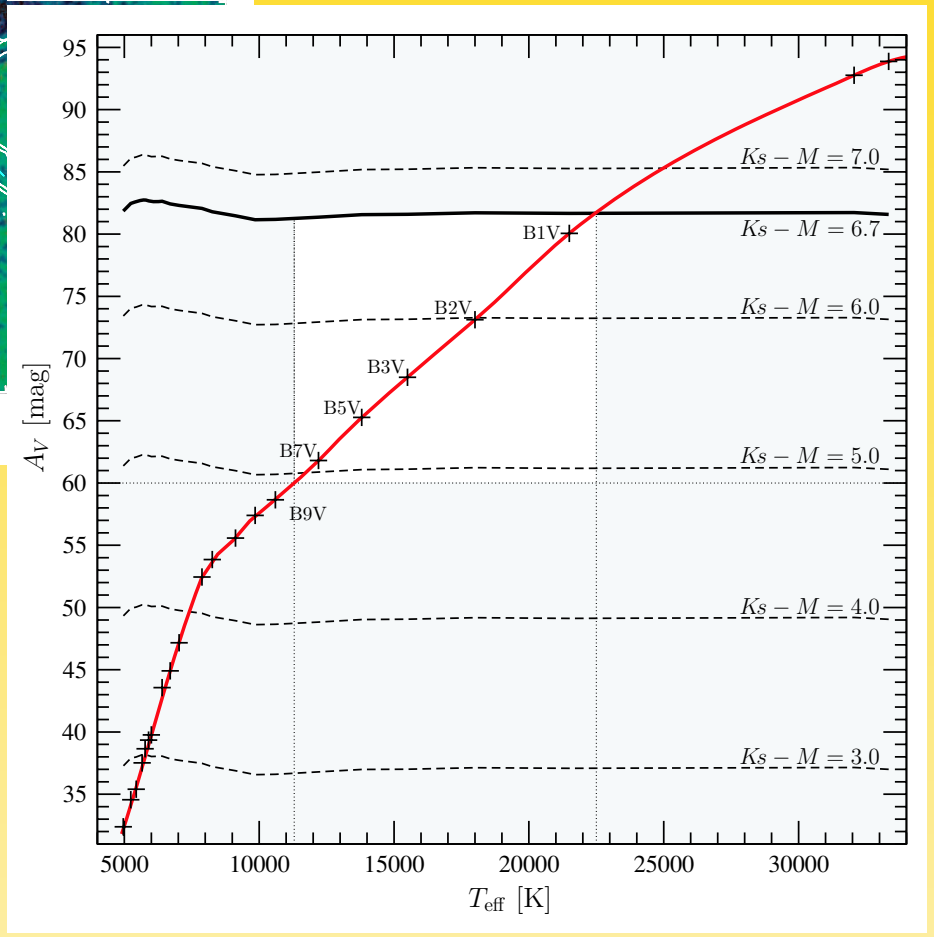

Cut along the Major Axis of the Disk, running at an Angle of 45° across our PdBI $^{13}$CO (1–0) Data Cube

$\Longrightarrow$ **Velocity Shift of 1.7 km s$^{-1}$ over 30 800 AU**

Comparison to Theoretical Position – Velocity Diagram for an Edge-On Disk around a 15 $\mathcal{M}_\odot$ Star; Outer Part in **Keplerian Rotation**, Inner Part as Rigid Rotator

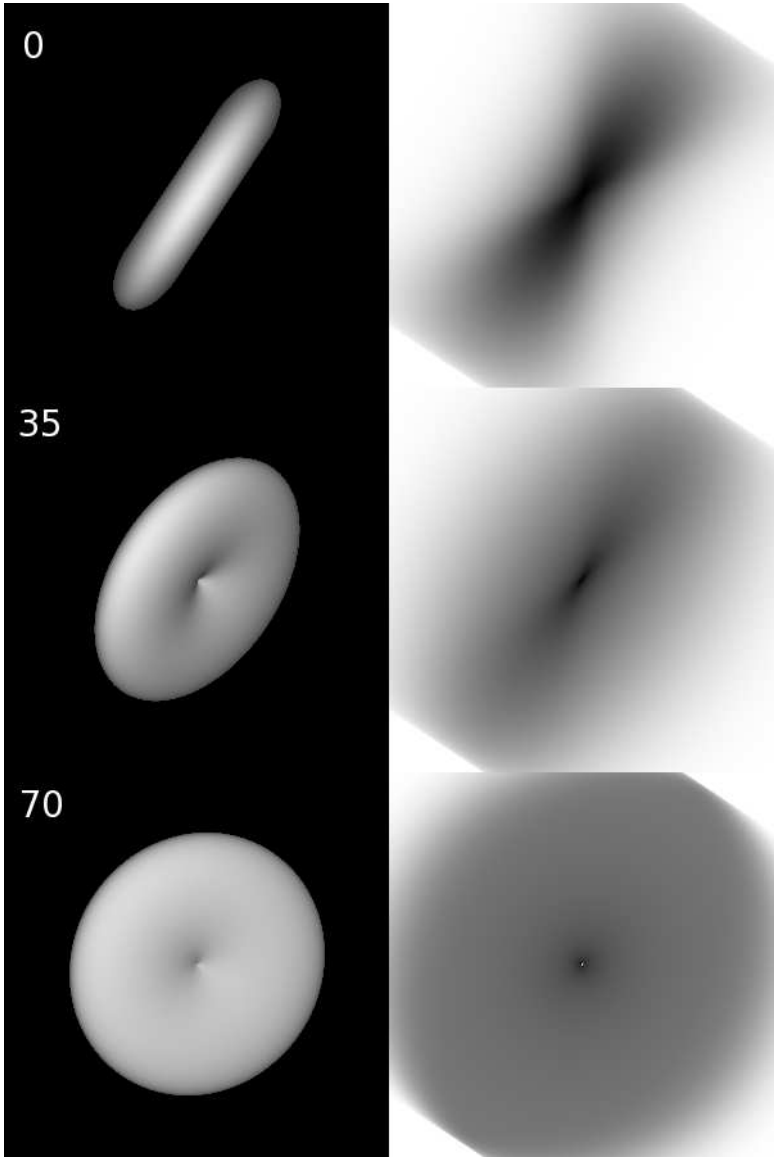
# Probing the Center of the M 17 Silhouette Disk



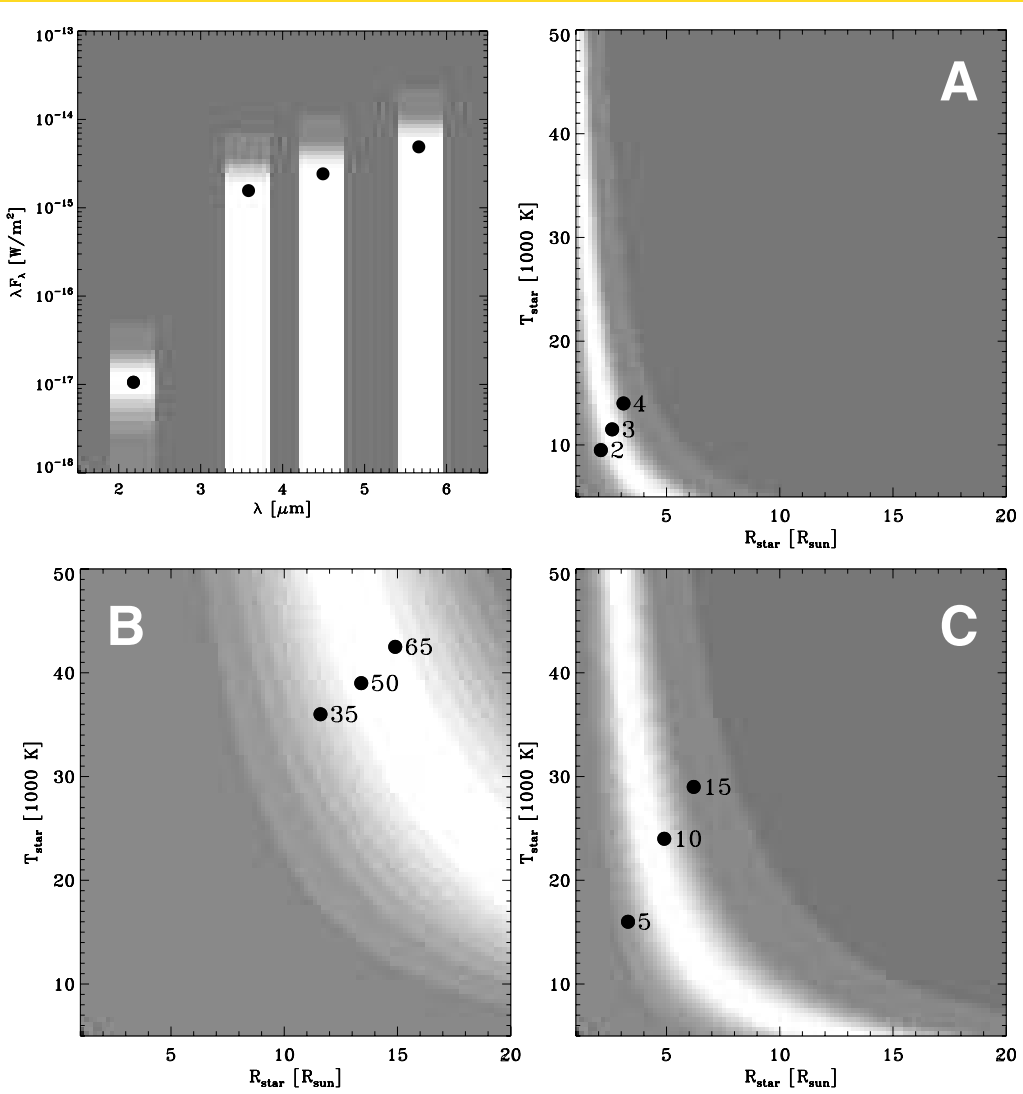




**Nielbock et al. 2008, MNRAS, 388, 1031**

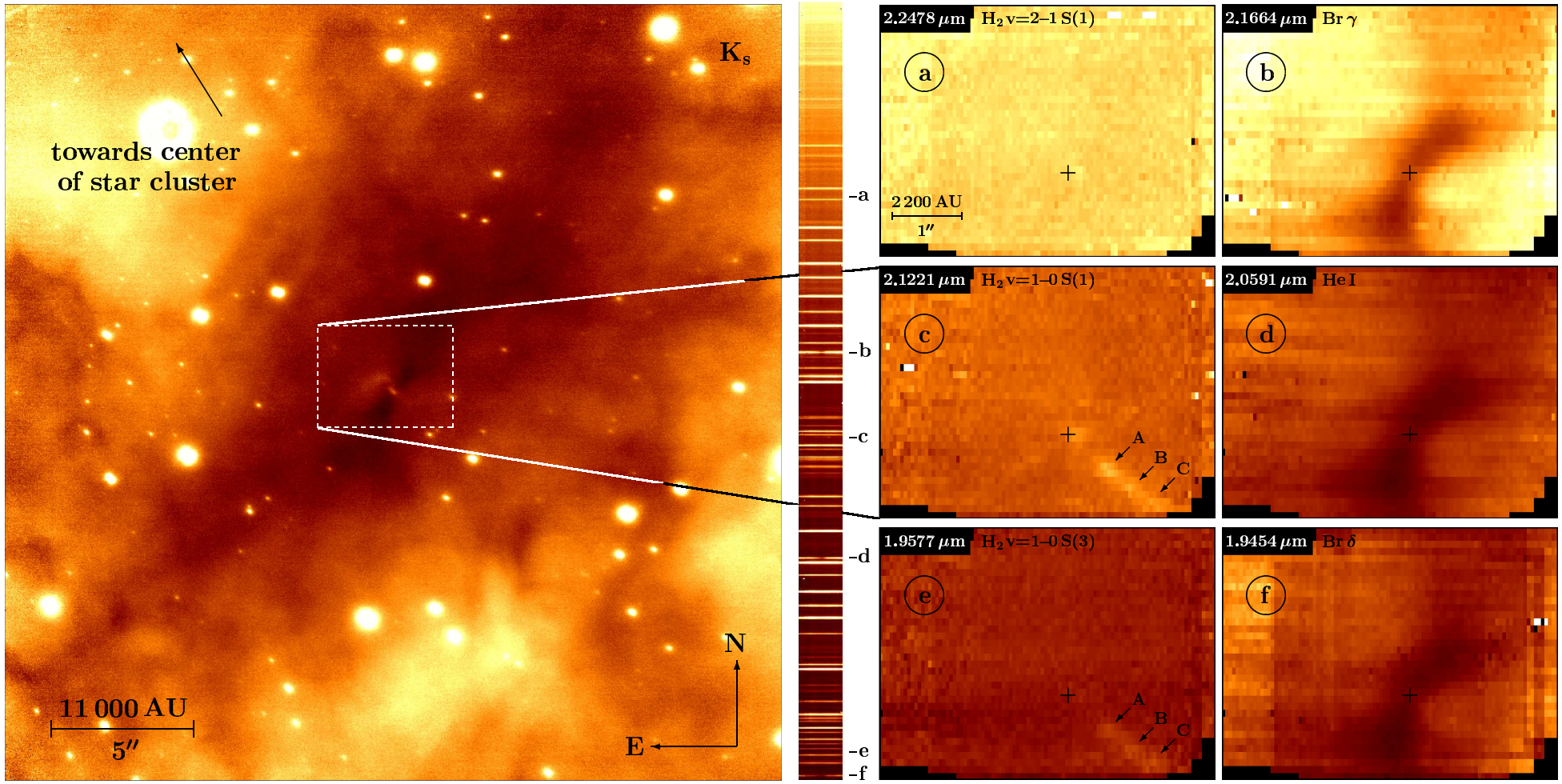
# 3D Radiative Transfer Modeling of the Silhouette Disk




**Steinacker et al. 2006, A&A, 456, 1013**



# Detection of an $H_2$ Jet associated with the M 17 Silhouette Disk




NACO Imaging SINFONI IF Spectroscopy

Nürnberger et al. 2007, A&A, 465, 931

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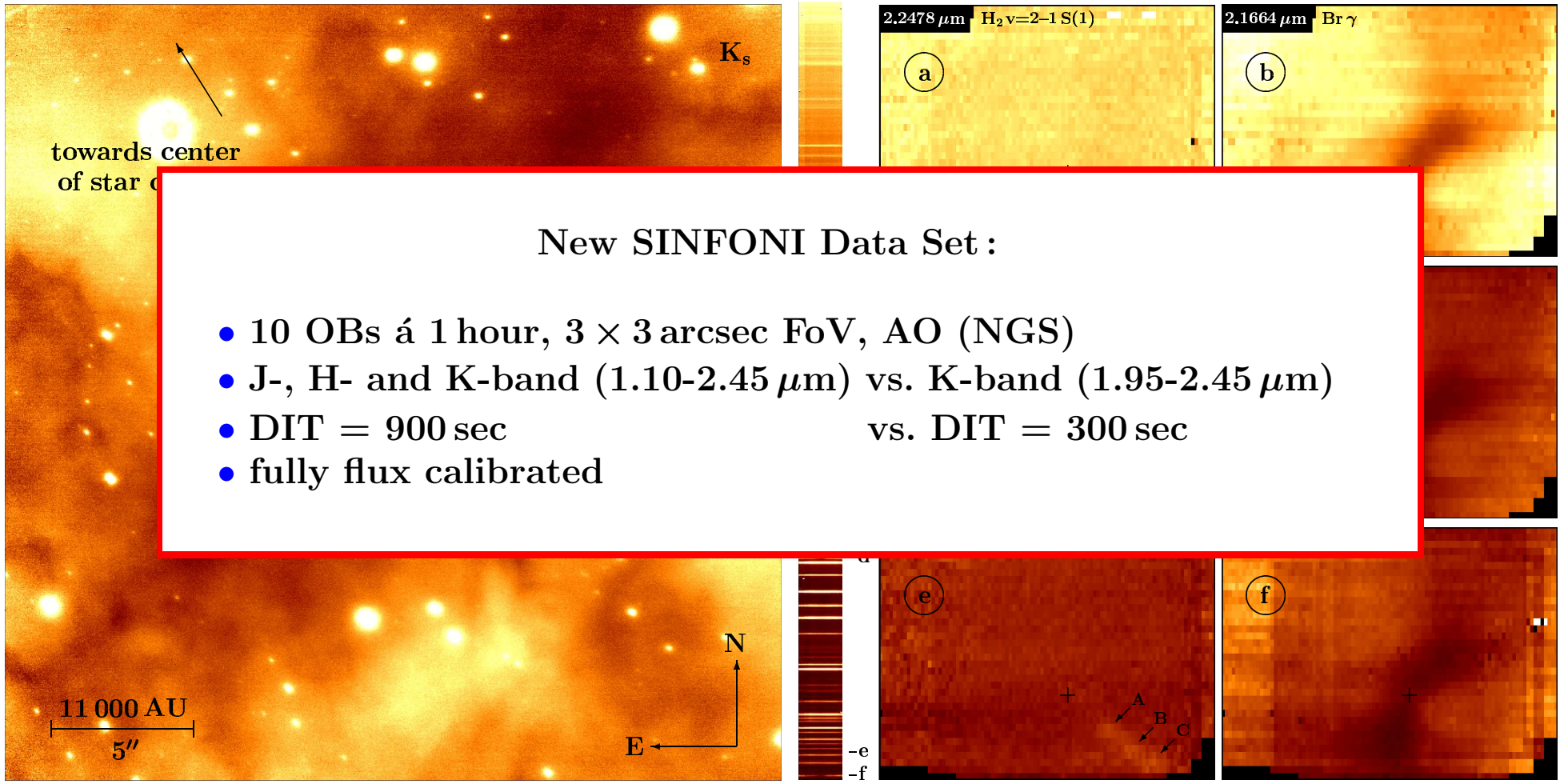


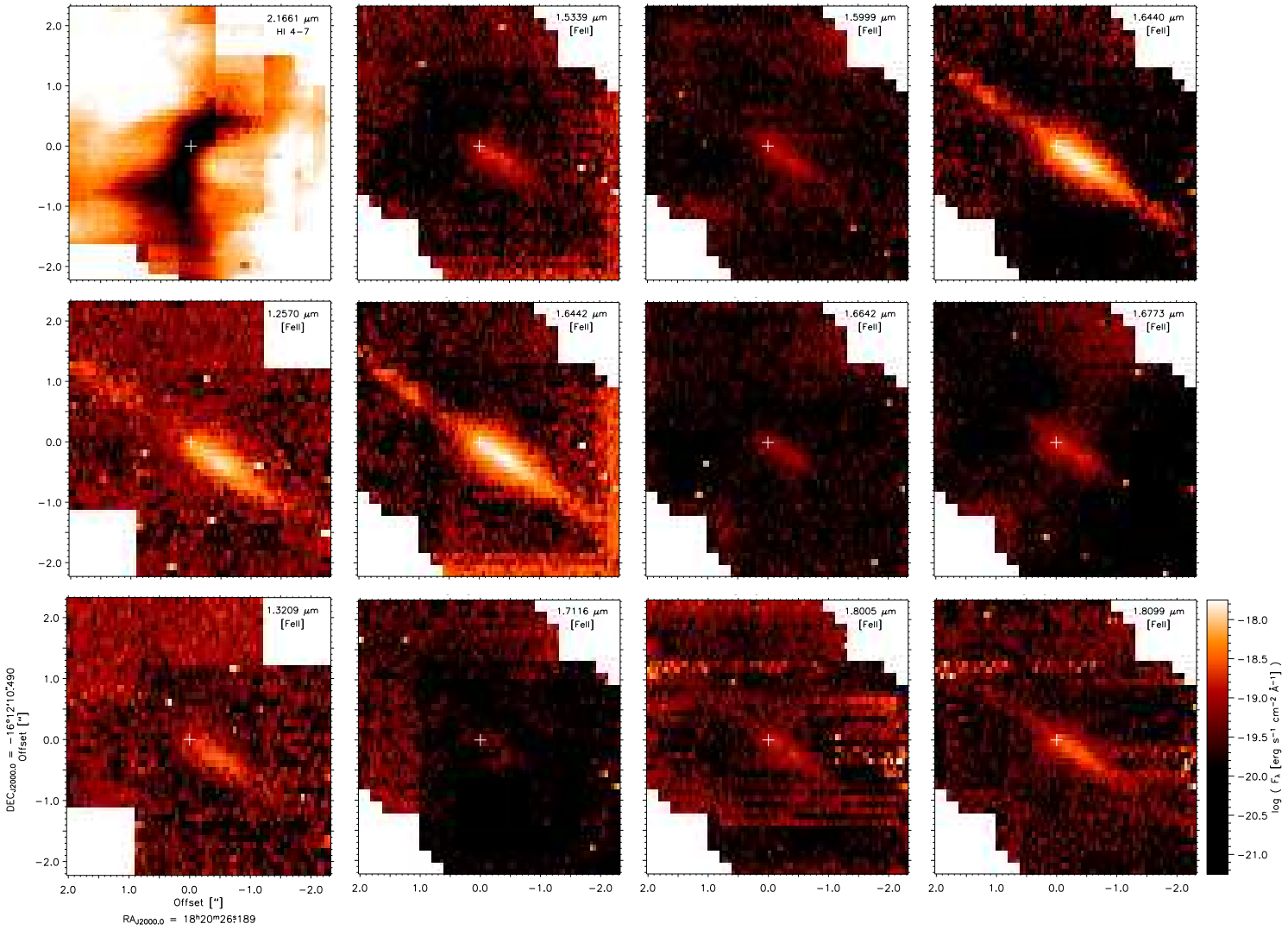

**New SINFONI Data Set :**

- 10 OBs á 1 hour, $3 \times 3$ arcsec FoV, AO (NGS)
- J-, H- and K-band (1.10-2.45 $\mu$m) vs. K-band (1.95-2.45 $\mu$m)
- DIT = 900 sec vs. DIT = 300 sec
- fully flux calibrated

**NACO Imaging** **SINFONI IF Spectroscopy**

Nürnberger et al. 2007, A&A, 465, 931

# Detection of [Fe II] Emission from the Jet associated with the M 17 Disk




**Nürnberger et al. 2010, A&A, in prep.**