High-angular resolution observations of HD179218: Early stages of disk dissipation?

J. Kluska
Disk evolution

- Disk evolution $\rightarrow$ Disk dissipation is fast: $\sim 10^5$ yrs

Alexander et al. 2014
Disk evolution

Banzatti & Pontoppidan 2015
van der Plas et al. 2015
Disk evolution around Herbig Ae/Be stars

OR

Transition disk (group I)

Flat disk (group II)

Meeus et al. 2001

Maaskant et al. 2013
Disk evolution around Herbig Ae/Be stars

Klarmann et al. 2017; Lazareff et al. 2017
Disk evolution around Herbig Ae/Be stars

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Klarmann et al. 2017; Lazareff et al. 2017
HD179218

✦ Group I disk
HD179218

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- Distance 293pc (Bailer-Jones et al. 2018)
HD179218

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✦ The most extended NIR emission from all targets of the PIONIER large program
HD179218

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- Distance 293pc (Bailer-Jones et al. 2018)
- The most extended NIR emission from all targets of the PIONIER large program
- PAH features with high ionisation fraction (Seok et al. 2017)
HD179218

- Group I disk
- Distance 293pc (Bailer-Jones et al. 2018)
- The most extended NIR emission from all targets of the PIONIER large program
- PAH features with high ionisation fraction (Seok et al. 2017)
- Disk with cavity deduced from rovib $^{12}$CO and $^{13}$CO emission (Banzatti et al. 2015)
A high-angular-resolution observing campaign of HD179218
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  - Long baselines interferometry
    - Near-infrared (VLTI/AMBER & PIONIER, CHARA/CLIMB & CLASSIC)
    - Mid-infrared (archival data from VLTI/MIDI)
  - Aperture masking (KECK/NIRC2)
A high-angular-resolution observing campaign of HD179218

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  - Polarimetric Direct imaging: SPHERE/ZIMPOL
Direct Imaging (SPHERE/ZIMPOL)

Kluska et al. 2018a
Direct Imaging (SPHERE/ZIMPOL)

Off-centred Gaussian:
FWHM = 252.1±1.1 mas ~ 75au

$i=47.4^\circ\pm0.3^\circ$ ; $PA=24.8^\circ\pm0.4^\circ$

Kluska et al. 2018a
Mid-infrared interferometry (MIDI)

Gaussian Ring
R = 41.8±0.9 mas ~12au
i=52.5°±6.1°; PA=26.4°±6.2°

Kluska et al. 2018a
Near-infrared interferometry

KECK/NIRC2

Kluska et al. 2018a
Near-infrared interferometry

Asymmetry map

Kluska et al. 2018a
Near-infrared interferometry

KECK/NIRC2

Kluska et al. 2018a
Near-infrared interferometry

KECK/NIRC2  VLTI/PIONIER

Kluska et al. 2018a
Near-infrared interferometry

KECK/NIRC2  VLTI/PIONIER&AMBER

Kluska et al. 2018a
Near-infrared interferometry

KECK/NIRC2  VLTI/PIONIER\&AMBER  CHARA/CLIMB\&CLASSIC

\[ v^2 \]

\[ \text{Closure Phase} \]

\[ f (\text{M} \lambda) \]

\[ f_{\text{max}} (\text{M} \lambda) \]

Kluska et al. 2018a
Near-infrared interferometry

Long baseline interferometric data - Fit results - chi2=6.1
FWHM=51.0±2.4mas - ~10au!
i=54.8°±3.0°; PA=25.5°±2.6°
T_{env}=1435±28K

Lazareff et al. 2017, Kluska et al. 2019a, soumis
Disk structure

Infrarouge proche | IR moyen | SPHERE/ZIMPOL

QHPs: quantum heated particles

T=1500K

sublimation

QHPs

Compagnon?

Bord interne du disque externe

Surface du disque

0.2

12.3

UA

Kluska et al. 2018a
Disk evolutionary state

Banzatti & Pontoppidan 2015
Kluska et al. 2018a
Conclusions

- MWC614 has an **extended NIR emission at** $T_{sub}$ **but not at** $R_{sub}$
- **A pre-transitional disk in a peculiar stage:** dispersion of its inner disk? Dust filtering via a companion? (upper limit: 0.34 Msun)
- Looking for companion
- Follow-up on the complex disk structures
- Radiative transfer model reproducing this rich dataset

- **Multi-instrument, multi-wavelength approach perfect to study disk structure in the inner disk**
- **VLTI/MATISSE + GRAVITY / CHARA / SPHERE / ALMA**