Synoptic Observations of Young Stars with Planet-Building Disks

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DIAGNOSTICS - gas & DUST

SAO 206462

Beryll 2.166 μm

λ (μm)

λF (W/m²)

3.3×10⁻¹²

3.35×10⁻¹²

3.4×10⁻¹²

3.45×10⁻¹²

3.5×10⁻¹²

Star

Dust rim

Disk wind (Brγ, Hα line)

Inner gas disk (Brγ, CO line)

Magnetospheric accretion (Brγ line)

Puffed-up inner rim (NIR continuum)

Material inside the rim (NIR continuum)

Disk flaring properties (NIR/MIR continuum)

Dust mineralogy (Silicate and PAH feature)

V1247 Ori

10⁻¹³

10⁻¹²

10⁻¹¹

λ (μm)

T=7250 K
 Log g=4.5
 ε=385 pc
 B=2.36
 E(B-V)=0.02
 (E(B-V)=0.00)

IRTF Workshop 2018
2003 - inner rim was 20% bigger!
Increased disk wall height - increased near IR flux - causes increased shadowing and drop in mid-IR flux ("see-saw")

References:
- □ (1)  + (2)  • (3)  ○ (4)  △ (5)  × (6)
- ▼ (7)  × (8)  △ (9)  ● (10)  ★ (11)  Optical
- × (12)  ◦ (13)  ○ (14)  × (15)  ■ (16)  NIR

IR only sparsely sampled

JD - 2400000
HD 163296 = MWC 275

Periodic HH Knots

Proper motion traceback

~16 year photometric period

- Shock front
- Dust cloud
- High-velocity jet
- Low-velocity disk wind
- Inner gas disk
- Dust-free region
- Angular momentum transfer

Dimensions: 0.5 AU to up to 200 AU
MCRT Model

jet thermal emission

V band drop

middle disk no longer shadowed

jet blocks direct illumination by star

from Monika Pikhartova et al. AAS 2017 & 2018
What Next?

Coordinate with Interferometers (again)
Already did this with Keck (no longer KI) & VLTI/MATISSE (mid-IR 4T)
Discussed with CHARA Director and 6T Scientists Monnier last year

Kraus et al. 2013

What Next?

Support of JWST (& other Coronagraphs) - What IS the illumination of the disks? (bright stars observable with JWST/MIRI coronagraph, NIRISS-SAM)

SAO 206462
(Muto et al. 2012)

MWC 480
(Kusakabe et al. 2012)
What Next?

Return of MIRSI with Visible-Wavelength (Guider) Capability and Extension to mid-IR - variability, including “see-saw” behavior, daytime observing