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# BROWN DWARF DISKS — A CHALLENGE FOR MIDI

I. Pascucci[1], D. Apai[1], S. Wolf[2] and Th. Henning[1]

**Abstract.** We carried out Radiative Transfer (RT) calculations to investigate the properties of disks around young, Very Low Mass Objects (VLMOs) and Brown Dwarfs (BDs). We explore the possibility of resolving such disks in the mid-infrared with MIDI depending on the parameters: source distance and declination, disk inclination and extension.

## 1 Introduction

The recent discovery of many sub-stellar mass objects raises the question of their formation. Stellar-like accretion and ejection from a multiple system during the accretion phase are two possibilities. To distinguish between them a detailed study of the circumstellar disk is needed: while the first scenario results in a complete disk, the second implies a truncated one. Up to now the only strong BDs disk candidates have been identified in the Cha I star forming region (Comerón *et al.* 2000).

## 2 Radiative Transfer Simulations

We used the MC3D RT-code (Wolf *et al.* 2000) to simulate spectral energy distributions (SEDs), 10 and 20 micron images of the disks around Cha I H$\alpha$1, a bona-fide BD, and Cha H$\alpha$2, a VLMO. Scaled down T Tauri-like disks have been adopted (for the model parameters see Tab. 1 and Natta & Testi 2001). We applied different inner cavities and disk extensions to investigate their influence on the mid-infrared emission. Finally, we used the SIMVLTI tool to determine the maximum distance at which such disks can be resolved with MIDI.

## 3 Results

Based on our RT simulations we calculate the distances at which the models described by the different disk formation scenarios can be distinguised using the

[1] AIU Jena, Schillergaesschen 2-3, Jena, D-07745 Germany
[2] California Institute of Technology, 1200 E California Blvd, 220-6 Pasadena, CA 91106


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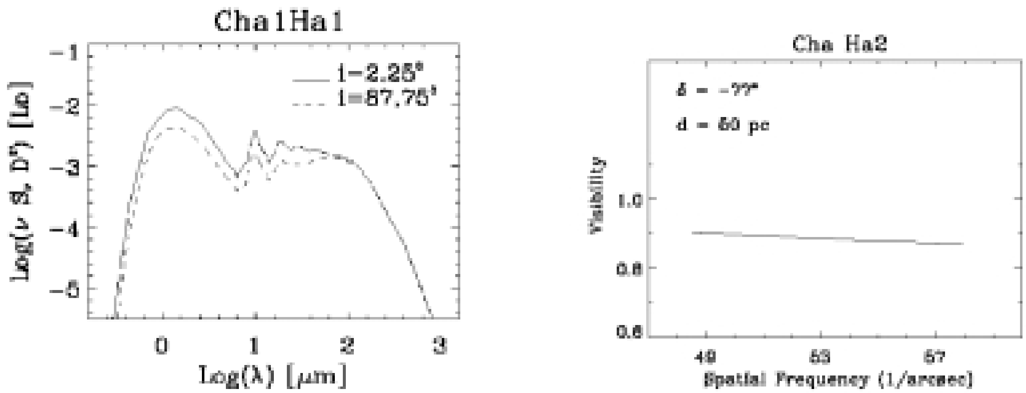


**Fig. 1.** Left panel: SED of Cha H$\alpha$1 corresponding to the model 1 (see Tab. 1). Solid line (dashed line) for the face-on (egde-on disk). Right panel: 10 micron visibility curve for Cha H$\alpha$ 2 model 1 using UT1 and UT4. The disk is resolved at a distance of 50 pc.

**Table 1.** Model parameters and maximum distances at which the disks are resolved by MIDI, results of our combined RT and SIMVLTI simulations.

| Source | L $[L_\odot]$ | $T_{\rm eff}$ [K] | $R_{in}$ $[R_\star]$ | model | $R_{disk}$ [AU] | $M_{disk}$ $[M_\odot]$ | d [pc] |
|---|---|---|---|---|---|---|---|
| | | | | 1 | 100 | $9.1\times10^{-4}$ | 40 |
| Cha Ha1 | 0.010 | 2600 | 1.5 | 2 | 50 | $2.5\times10^{-4}$ | 30 |
| | | | | 3 | 10 | $1.1\times10^{-5}$ | 20 |
| | | | | 1 | 100 | $9.7\times10^{-4}$ | 50 |
| Cha Ha2 | 0.035 | 2550 | 1.5 | 2 | 50 | $2.6\times10^{-4}$ | 40 |
| | | | | 3 | 10 | $1.2\times10^{-5}$ | 30 |

VLTI/MIDI facility. (see Tab. 1 last column). We find that non-truncated disks with small inner cavities (i.e. stronger flaring) are the easiest to detect from our models (see Fig. 1). The declination of the source is a fundamental parameter: a disk like model 1 for Cha H$\alpha$2 would be detected at 120 pc if the source had a declination of -30 degree.

## References

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