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IMAGING OF THE DUST GAP INTO THE TRANSITIONAL DISK RXJ1633.9-2242 (OPH 32)

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The infrared spectral energy distributions (SEDs) of circumstellar transitional disks reveal the presence of an optically thin inner region and an optically thick outer disk. As a class they are relatively rare, and only the brightest are suitable for resolving disk structure. Only a few transitional disks have been studied on the scales necessary to resolve the central cavity. We present here Submillimeter Array (SMA) observations of the continuum emission from the disk around RXJ1633.9-2242, which we previously established as an excellent candidate to harbor forming giant planets as suggested by its low mass accretion rate, the relatively massive disk, and the SED morphology. We have also performed a radiative transfer modeling of the SED and derived a set of best fitting properties for the disk.

A large set of *Spitzer*-selected transitional disks in the Ophiuchus molecular cloud ($d = 125$ pc) was examined by Cieza et al. (2010), and 4 of the targets were identified as (giant) planet-forming candidates. For one of them, RXJ1633.9-2242, target #32, we have obtained an SMA image at 345 GHz, in its very extended configuration. The viewing geometry of this disk is signed by a large inclination, giving the image the appearance of a doughnut cross-section. It exhibits diminished continuum emission intensities out to sizable distances from the central stellar position. We confirm the presence of an evacuated cavity with radius $\sim$25 AU, consistent with having been carved by embedded giant planets.

We have used the Monte Carlo radiative transfer package RADMC (Dullemond & Dominik 2004) to construct a parametric model of the dust distribution in a flared disk with an inner cavity and calculated the temperature structure consistent with the density profile, in thermal equilibrium with the irradiating star (spectral type K7, $R_\star = 1.7\ R_\odot$, $M_\star = 0.7\ M_\odot$, $T_\star = 4000$ K, and age $\sim$2 Myr). We have generated a grid of models and identified the best fit parameters.

TABLE 1

DISK PARAMETERS

M_d	22 $M_{\rm Jup}$
γ	1.
H_{100}	2 AU
ψ	0.11
$R_{\rm cav}$	12 AU
$\delta_{\rm cav}$	10^{-7}
i	70°

The properties of RXJ1633.9-2242 are summarized in the Table 1, where we follow the parametrizations and nomenclature given in Andrews et al. (2009). We have included our preliminary results for the disk parameters (Orellana et al. in preparation, and the image analysis will be presented somewhere else). We find this disk to be physically flat as the dust scale height at 100 AU is only $\sim$2–3 AU (between 5 and 8 times smaller than the expected for gas in hydrostatic equilibrium). This indicate a considerable degree of grain growth and dust settling that deserves to be investigated with further modeling and follow up observations in order to break some of the degeneracies of the models and better constrain the physical properties of this and similar fascinating disks.

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REFERENCES

Andrews, S. M., Wilner, D. J., Hughes, A. M., Qi, C., & Dullemond, C. P. 2009, ApJ, 700, 1502
Cieza, L. A., et al. 2010, ApJ, 712, 925
Dullemond, C. P., & Dominik, C. 2004, A&A, 417, 159