Probing the dusty disks of high-mass protostellar objects

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The presence of accretion disks around high-mass protostars has been long speculated until recently, a number of disks of various type have been discovered[1-3]. Given the scattering properties of dust grains, it is rather easy to detect the dusty disk around the high-mass protostars. We present near-infrared polarimetric images of several high-mass protostellar objects. These images show the bipolar morphology, suggesting the anisotropic distribution of dust around the objects. Further analysis suggests that such a kind of morphology can be best interpreted as a dusty disk around these objects. Monte Carlo simulations by assuming different dust properties and disk inclination angle confirm the interpretation. In view of the advantage of high-resolution near-infrared polarimetric images, we propose that such a method is one of the best approaches to probe the dusty disks around high-mass protostars.

Keywords: near infrared; polarization; star formation; high-mass stars; circumstellar disk

Table 1. Disk parameters of the high-mass protostars

Name	D (Kpc)	L(L_{SUN})	Sp type	Size[1] (AU)	Ref.[2]
S140 IRS1	0.9	5.0E+03	early B	2700	(1)
S255 IRS1	2.4	…	O,B0	5700	(2,3)
NGC7538IRS1	2.8	8.3E+04	O6	…	(4)
IRAS23033+5951	3.5	2.5E+04	B0.5	6700	(5)
AFGL 4029	2.2	2.1E+04	O9	8600	(6)
BN	0.5	4.0E+03	B0.5	800	(7)

[1]The projected length of the PD at adopted distance.
[2]Ref. Code 1. Lester et al. (1986); 2. Howard, Pipher, &Forrest (1997); 3. Itoh et al. (2001); 4. Kraus et al. (2006); 5. Williams, Fuller, & Sridharan(2005); 6. Alvarez et al. (2004; 7.Jiang et al. (2005)

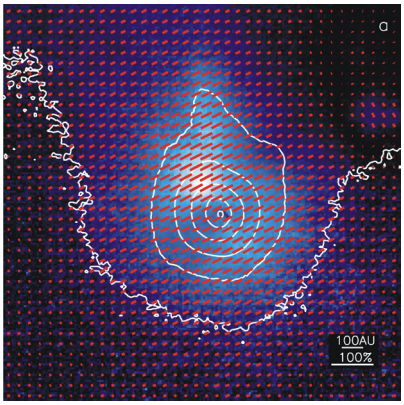

Figure 1. Polarization degree image of the BN object showing a low-polarization lane, indicating the presence of a dusty disk around this object

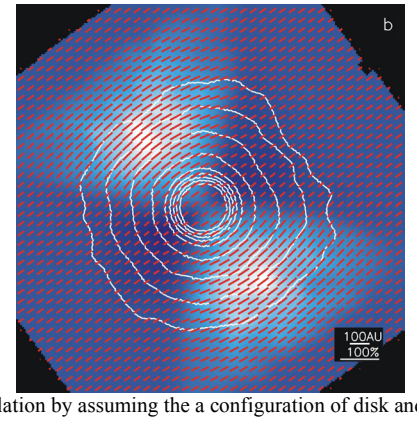

Figure 2. Monte Carlo simulation by assuming the a configuration of disk and envelop can reproduce the observed feature.

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