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

<table>
<thead>
<tr>
<th>Name</th>
<th>D (Kpc)</th>
<th>L(L_\odot)</th>
<th>Sp type</th>
<th>Size (AU)</th>
<th>Ref.</th>
</tr>
</thead>
<tbody>
<tr>
<td>S140 IRS1</td>
<td>0.9</td>
<td>5.0E+03</td>
<td>early B</td>
<td>2700</td>
<td>(1)</td>
</tr>
<tr>
<td>S255 IRS1</td>
<td>2.4</td>
<td>…</td>
<td>O,B0</td>
<td>5700</td>
<td>(2,3)</td>
</tr>
<tr>
<td>NGC7538IRS1</td>
<td>2.8</td>
<td>8.3E+04</td>
<td>O6</td>
<td>…</td>
<td>(4)</td>
</tr>
<tr>
<td>IRAS23033+5951</td>
<td>3.5</td>
<td>2.5E+04</td>
<td>B0.5</td>
<td>6700</td>
<td>(5)</td>
</tr>
<tr>
<td>AFGL 4029</td>
<td>2.2</td>
<td>2.1E+04</td>
<td>O9</td>
<td>8600</td>
<td>(6)</td>
</tr>
<tr>
<td>BN</td>
<td>0.5</td>
<td>4.0E+03</td>
<td>B0.5</td>
<td>800</td>
<td>(7)</td>
</tr>
</tbody>
</table>

1The projected length of the PD at adopted distance.
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 configuration of disk and envelop can reproduce the observed feature.

References