Imaging the water snowline in a protostellar envelope with H\textsuperscript{13}CO++

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Table 1. Overview of the molecular line observations toward IRAS2A.

<table>
<thead>
<tr>
<th>Transition</th>
<th>Frequency (GHz)</th>
<th>(E_u)/k (K)</th>
<th>Beam (&quot;)</th>
<th>(\Delta v) (km s(^{-1}))</th>
</tr>
</thead>
<tbody>
<tr>
<td>H\textsuperscript{13}CO^+ J = 3 – 2</td>
<td>260.255</td>
<td>25</td>
<td>0.93x0.68</td>
<td>0.09</td>
</tr>
<tr>
<td>H\textsuperscript{18}O 3(_1) – 2(_2)</td>
<td>203.408</td>
<td>204</td>
<td>0.87x0.72</td>
<td>0.115</td>
</tr>
<tr>
<td>DCO^+ J = 2 – 1</td>
<td>144.068</td>
<td>10</td>
<td>2.1x1.7</td>
<td>4.06</td>
</tr>
</tbody>
</table>

Notes. \(^{1}\) Velocity resolution.

Fig. 2. Integrated intensity map for the H\textsuperscript{13}CO\^+ J = 3 – 2 transition (color scale) toward IRAS2A, with the 1.2 mm continuum overlaid in white contours (top panel) and the H\textsuperscript{18}O 3\(_1\) – 2\(_2\) transition in blue contours (middle panel). The continuum contours are 1.8 \((1\sigma) \times [3, 10, 25, 50, 75]\) mJy beam\(^{-1}\), and the H\textsuperscript{18}O contours are 9.8 \((1\sigma) \times [3, 8, 15, 25, 35]\) mJy beam\(^{-1}\) km s\(^{-1}\). The beams are depicted in the lower left corners. The position of the continuum peak is marked by a black cross (the close binary is unresolved in these data) and the outflow axes by red and blue arrows. The integrated intensities along the dashed white line are shown in the bottom panel, normalized to their maximum value. The zero flux level and source position are marked by dotted lines.

H\textsuperscript{13}CO\^+のemission peak　continuum peakの北~2''
一方、H\textsuperscript{18}Oはコンパクトなemission
Analysis and discussion

1. Parametrized abundance profile for H$^{13}$CO$^+$

To establish the origin of the dip in the H$^{13}$CO$^+$ profile, but only a simulated image representing the observed profile, but only a used to construct the zeroth moment maps. Including all changes, the abundance of H$^{13}$CO$^+$ in the H emission present on source, it is related to the spectral energy distribution (SED) and the spatial extent. Based on the chemical network, the H$^{13}$CO$^+$ abundance is not the goal of this work. Finally, the absorption feature for H$^{18}$O and CO$^+$ cannot be modeled to the spectral energy distribution (SED) and the spatial extent. Based on the chemical network, the H$^{13}$CO$^+$ abundance is not the goal of this work. Finally, the absorption feature for H$^{18}$O and CO$^+$ cannot be modeled to the spectral energy distribution (SED) and the spatial extent. Based on the chemical network, the H$^{13}$CO$^+$ abundance is not the goal of this work. Finally, the absorption feature for H$^{18}$O and CO$^+$ cannot be modeled to the spectral energy distribution (SED) and the spatial extent. Based on the chemical network, the H$^{13}$CO$^+$ abundance is not the goal of this work. Finally, the absorption feature for H$^{18}$O and CO$^+$ cannot be modeled.

2. Water ice in the H$^{13}$CO$^+$

The absorption feature for H$^{18}$O and CO$^+$ cannot be modeled to the spectral energy distribution (SED) and the spatial extent. Based on the chemical network, the H$^{13}$CO$^+$ abundance is not the goal of this work. Finally, the absorption feature for H$^{18}$O and CO$^+$ cannot be modeled. The dashed green line shows the empirically inferred abundance profile for H$^{13}$CO$^+$ (scaled down by a factor 100). Right panels: As left panels, but with the temperature increased by a factor 2.2. The vertical dotted lines mark the H$^{13}$CO$^+$ and CO snowlines.

Fig. 6. Left panels: Temperature (gray) and density (blue) profiles for the IRAS2A envelope from Kristensen et al. (2012) (top), and the corresponding H$^{13}$CO$^+$ (light blue), CO (blue) and HCO$^+$ (purple) abundances predicted by the GRAINOBLE model (bottom). The dashed green line shows the empirically inferred abundance profile for H$^{13}$CO$^+$ (scaled down by a factor 100). Right panels: As left panels, but with the temperature increased by a factor 2.2. The vertical dotted lines mark the H$^{13}$CO$^+$ and CO snowlines.

水スノーラインの角度外側でH$^{13}$CO$^+$が増加：

水スノーラインの角度外側でH$^{13}$CO$^+$が増加：

化学モデルの予測と一致

一方H$^{13}$CO$^+$のabundanceピークは360AUからさらに135AU外側）

水スノーラインは225AUに置かれる。

1Dエンベロープの温度構造から予測される距離よりも、かなり遠い

H$^{13}$CO$^+$とH$^{18}$Oの空間的不一致：

「H$^{13}$CO$^+$は水スノーラインのトレーサーとして使われる」ことを示す。
The Near-Infrared Outflow and Cavity of the proto-Brown Dwarf Candidate ISO-Oph 200*

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proto-brown dwarf候補天体のNIR観測論文。

天体：ISO-Oph 200（0.06+-0.01 Msun）。SEDからClass Iと考えられている（Evans+09）

観測：integral field spectrograph SINFONIを使ってVLTで観測。

コンパクトなblueシフトoutflow：全てのラインで見えている

速度の遅い（～+/-10km/s）red&blueシフトの広がったemission：
H2のみで見える

方向は、速いコンパクトなemissionとは異なるPAを持っている。

<table>
<thead>
<tr>
<th>Outflow Feature</th>
<th>( \dot{V} ) (( \text{km/s} ))</th>
<th>Offset (( \text{arcsec} ))</th>
<th>PA (( \text{degree} ))</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \text{H}_2 ) Jet</td>
<td>-35 ( \pm ) 2</td>
<td>0.2</td>
<td>230</td>
</tr>
<tr>
<td>Fe II Jet</td>
<td>-51 ( \pm ) 5</td>
<td>0.5</td>
<td>215</td>
</tr>
<tr>
<td>F1</td>
<td>4 ( \pm ) 3</td>
<td>40</td>
<td>67</td>
</tr>
<tr>
<td>F2</td>
<td>10 ( \pm ) 3</td>
<td>20</td>
<td>80</td>
</tr>
<tr>
<td>F3</td>
<td>-14 ( \pm ) 5</td>
<td>50</td>
<td>248</td>
</tr>
</tbody>
</table>

Table 1. Outflow emission features and corresponding properties. Offsets are with respect to the source position and along the given PA. PAs are measured E of N. It is argued that F1, F2 and F3 form part of a cavity around the jet.

コンパクトemission => jet

広がったH2 emission => cavityをトレース
Source's extinction: $A_v = 18$ mag +/- 1 mag
Outflow's extinction: $A_v = 9$ mag +/- 0.4 mag

H$_2$ outflow's temperature: 1422 K +/- 255 K
[Fe II] line density: $\sim 10000$ cm$^{-3}$

Mass outflow rate:
  For H$_2$, $M = 3.8 \times 10^{-10}$ M$_{\odot}$/yr
  For Fe II, $M = 1.0 \times 10^{-8}$ M$_{\odot}$/yr

Pa $\beta$ and Br $\gamma$ line luminosity,
star's mass (0.06 - 0.1 M$_{\odot}$),
  radius (0.9 - 0.5 R$_{\odot}$) used:
  $M_{\text{acc}} \sim (3-10) \times 10^{-8}$ M$_{\odot}$/yr

Extended H$_2$ emission that is seen in both [Fe II] and Fe II which is consistent with the geometry.
Opening angle of 40° can be fitted well.

In conclusion we argue that NIR studies of proto-BD jets can be investigated and measurements of the jet efficiency can be obtained. High angular resolution is not necessary to measure the jet efficiency. Therefore, we can use NIR observations for investigating jet launching in the BD mass regime. Evidence of outflow components such as wide-angled winds have been used as a constraint to jet launching models. Improvements in data and methods have been used to investigate jet launching in proto-BD jets. For example, Frank et al. (2014) gave the wide-angled wind opening angles of a number of Class 0 protostars. Values range between 25° and 100°. Davis et al. (2002) give the wide-angled wind opening angles of a number of Class 0 protostars. Values are limited by the use of optical data which has led to problems.

In proto-BDs, the mass loss rate is higher than in Class II BDs. Also note that the NIR HI lines. These improvements have meant that this estimate of the jet efficiency can be obtained. High angular resolution is not necessary to measure the jet efficiency. Therefore, we can use NIR observations for investigating jet launching in the BD mass regime. Observations of proto-BD jets have to be investigated and measurements of the jet efficiency can be obtained. High angular resolution is not necessary to measure the jet efficiency. Therefore, we can use NIR observations for investigating jet launching in the BD mass regime.

Riaz et al. (2017) presented results of leading jet launching models. Thus, studies of jet launching models set an upper limit of 30% for the jet efficiency. High angular resolution is not necessary to measure the jet efficiency. Therefore, we can use NIR observations for investigating jet launching in the BD mass regime. Observations of proto-BD jets have to be investigated and measurements of the jet efficiency can be obtained. High angular resolution is not necessary to measure the jet efficiency. Therefore, we can use NIR observations for investigating jet launching in the BD mass regime.

Extended H$_2$ emission has different geometry and kinematics in proto-BDs compared to Class II BDs. Values can be investigated and measurements of the jet efficiency can be obtained. High angular resolution is not necessary to measure the jet efficiency. Therefore, we can use NIR observations for investigating jet launching in the BD mass regime.

Overall our results put the jet efficiency study presented here. The results are limited by the use of optical data which has led to problems.
Gravity drives the evolution of infrared dark hubs: JVLA observations of SDC13

G. M. Williams, N. Peretto, A. Avison, A. Duarte-Cabral, and G. A. Fuller

背背景：フィラメントが集中している箇所（hub）は、星団・大質量星形成と深い関わり。
ハブの進化とそこでの星形成の関係の理解は重要。

目的：SDC13の運動・密度構造を調べ、進化やfragmentationの駆動源を決める

観測：NH₃(1,1) & NH₃(2,2) 輝線 with Jansky Very Large Array, Green Bank Telescope (0.07 pc)

全ての hubフィラメントはsupercritical （transonicの非熱的な速度分散を持つ）

コアの間隔： フィラメントに沿って~0.37pc

フィラメントの年齢：a few Myr（非平衡フィラメントの半解析的モデル（Clarke+16, 17）を使用）

<= Peretto+14の力学的タイムスケールとconsistent
フィラメントの結合部に最もmassiveなコアが付随（速度分散は最も大きい）
<= ハブ形状によって生まれる加速度勾配に起因すると考えられる

SDC13の進化シナリオ：
超音速乱流でのpost shock構造として、フィラメントが形成
乱流エネルギーの散逸の結果、高密度コアは亜音速に
重力が優位になり、hubの進化を促す。
それによって、重力エネルギーは運動エネルギーへと変換される
フィラメント連結部でのより大きな重力加速度勾配の発生が、大質量コア形成を促進

・2つのフィラメントでの大きな視線速度勾配：
  重力に起因するものではなく、HII領域からの圧縮の可能性が高い

・同定コアの73%で速度分散が増加：
  フィラメントの分裂過程に起因する物質の蓄積の結果と解釈

コアでの重力エネルギーから運動エネルギーへ変換効率を求めた (ε ~ 35 %)
<= 理論値よりも大きい