

# A Molecular Line Study of the Recently Discovered Class 0 source Barnard 1-c

Brenda C. Matthews<sup>1</sup>, M. Hogerheijde<sup>2</sup> and E.A. Bergin<sup>3</sup>

<sup>1</sup>Herzberg Institute of Astrophysics, 5071 W. Saanich Road, Victoria, BC, Canada V9E 2E7  
email: brenda.matthews@nrc-cnrc.gc.ca

<sup>2</sup>Leiden Observatory, Leiden University, Postbus 9513, 2300 RA Leiden, Netherlands  
email: michiel@strw.leidenuniv.nl

<sup>3</sup>Department of Astronomy, University of Michigan, 825 Dennison Building, 501 East University Avenue, Ann Arbor, MI 48109-1090  
email: ebergin@umich.edu

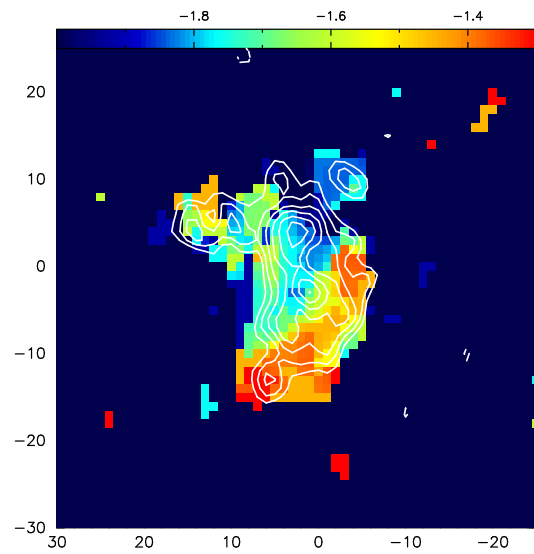
**Abstract.** We present a BIMA molecular line study of the class 0 source Barnard 1-c in the Perseus molecular cloud. As followup to the detection of an atypical polarization pattern in this young stellar object by Matthews & Wilson (2002), we have obtained high resolution data in CO, C<sup>18</sup>O, <sup>13</sup>CO, HCO<sup>+</sup>, and N<sub>2</sub>H<sup>+</sup> from BIMA, plus N<sub>2</sub>H<sup>+</sup> data from FCRAO. N<sub>2</sub>H<sup>+</sup> is destroyed in the core centre and along the jet axis due to the high abundance of CO. The N<sub>2</sub>H<sup>+</sup> data demonstrate that this core is rotating (see Figure 1) with its rotation axis aligned with the observed molecular outflow. We have used high spectral resolution data of N<sub>2</sub>H<sup>+</sup> to measure the velocity and linewidths across the core. In addition, we present models of the SED (using BIMA, JCMT, IRAS and Spitzer data) generated with DUSTY in order to estimate the size scale of the evaporated region. We compare the morphology and kinematics of the B1-c core and jet to those of NGC 1333 IRAS 2 and IRAM 04191+1522, another very young class 0 source.

**Keywords.** ISM: individual (Barnard 1-c), ISM: jets and outflows, ISM: kinematics and dynamics, stars: formation, submillimeter

---

## References

Matthews, B.C., & Wilson, C.D. 2002, *ApJ*, 574, 822



**Figure 1.** The moment 0 (contour) and moment 1 (colored greyscale) emission from the isolated hyperfine component of  $\text{N}_2\text{H}^+$  in Barnard 1-c . Rotation is clearly illustrated across the core. The outflow in CO is oriented at approximately  $125^\circ$  E of N.