Molecular environment of BHR 71

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Introduction

BHR 71 is a low mass star-forming region that contains two proto-stellar objects each with an associated outflow.

BHR 71 is known to contain thermal CH_3OH at high frequencies (Garay, 1998). We report the first detections of CH_3OH transitions at 36.1 GHz and 48.3 GHz, HC_3N at 36.4 GHz and 45.5 GHz, CS at 48.7 GHz, and SiO at 43.4 GHz for this source.

Observations

We observed BHR 71 using on-the-fly mapping with the Mopra single dish, located near Siding Spring Observatory, Australia. 12 zooms at 33 - 39 GHz, and 16 zooms at 41 - 49 GHz were used. Figure 1 shows our results.

We obtained 6 hours green time on the ATCA in order to observe the 36.1 GHz transition of CH_3OH. We used 1024 channels and a 4 MHz bandwidth. These observations could not confirm the maser nature of the emission as there were no detections on the longer baselines of an EW352 configuration. We also estimated a brightness temperature of 34.35 K for the northern lobe and 13.84 K for the southern lobe based on this data.

Results

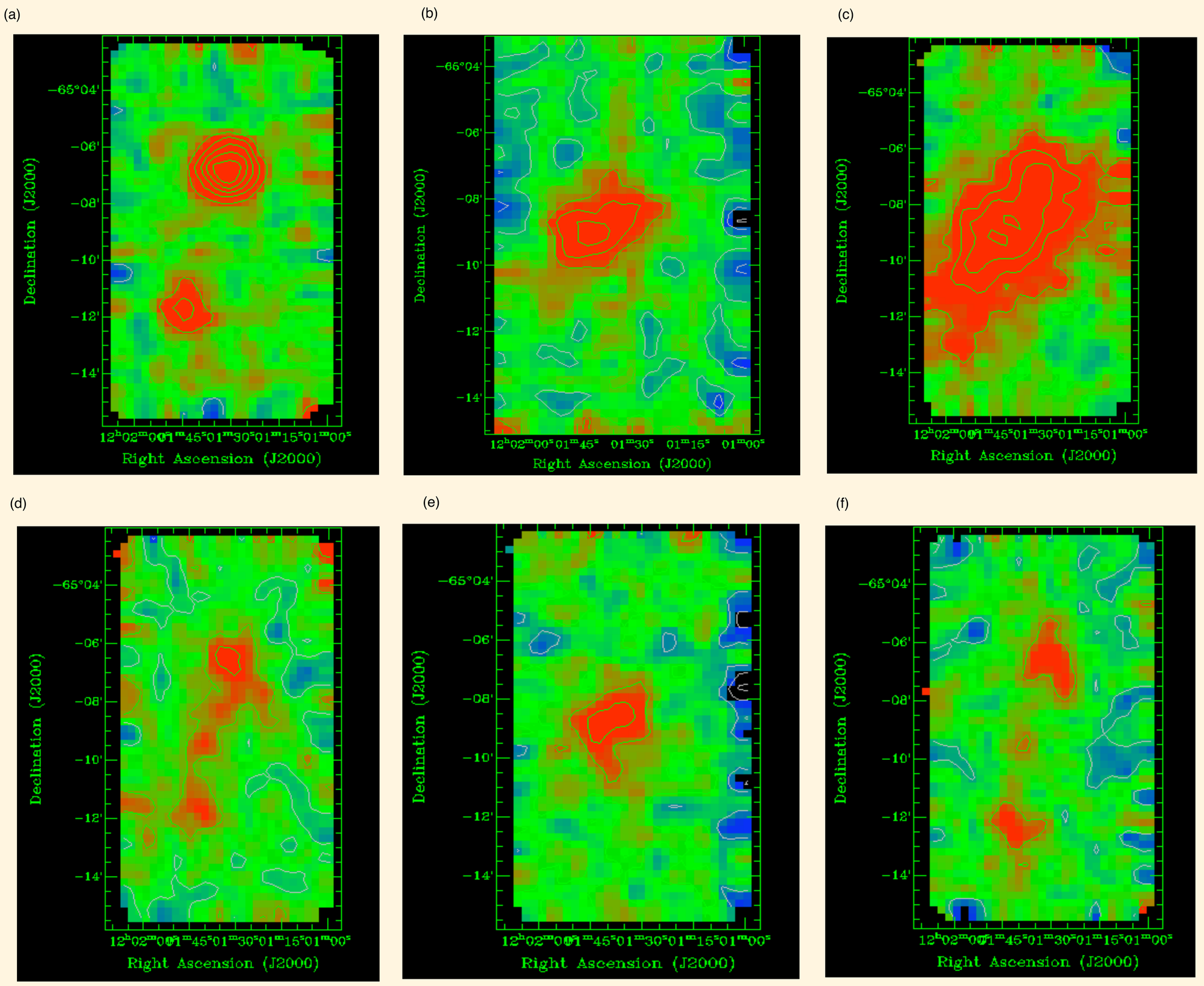

Figure 1. Maps of (a) CH_3OH at 36.1 GHz, (b) HC_3N at 36.4 GHz, (c) CS at 48.7 GHz, (d) CH_3OH at 48.3 GHz, (e) HC_3N at 45.5 GHz, and (f) SiO at 43.4 GHz for BHR 71. The two bright spots in (a) represent the northern and southern lobes indicating that CH_3OH lies within the outflow. This is the first detection of CH_3OH at this transition in this source. (d) shows CH_3OH at 48.3 GHz which is a well known thermal line. It falls along the same direction as the CO outflow detected by Parise (2006). Both CH_3OH transitions are located in the same region of the outflow.

(b) and (e) are the first detections of HC_3N in BHR 71. Conditions required for HC_3N are low temperatures. However, HC_3N is known to be present in hot cores as well as cold clouds, so we can't conclusively say that what we see here is the molecule in the core. (c) shows a strong detection of CS. CS is known to trace dense gas. Interestingly CS is found to encompass both the core and outflow regions. (f) shows a weak detection of SiO, particularly in the southern lobe. SiO is known as a shock tracer, tracing out the shock front of the jet-like emission coming from the protostar.

Literature cited

Garay, G. et al. 1998. Molecular abundance enhancements in the highly collimated bipolar outflow BHR71. *The Astrophysical Journal* 509, 768.

Parise, B. et al. 2006. CO and CH_3OH observations of the BHR71 outflows with APEX. *Astronomy & Astrophysics* 454, L79.

For further information

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http;//www.narribri.atnf.csiro.au/~vor010/presentations/TBrittonBHR71_7mm.pdf.