Exploring the Large-Scale Structure of an Intermediate-Mass Star Forming Cloud: Results from HARP

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Abstract

We present early results from an October 2007 HARP observing run at the JCMT. The primary goal of our project was to map an isolated intermediate-mass star forming region known as L1340B in order to investigate the possible effects produced by these intermediate mass stars on structure in nearby regions. The HARP observations were obtained in a single night on 2007 Oct 27, achieving an RMS ranging from 1.08 – 0.74K per 0.423 km/s channel (Figure 1). In addition we obtained a second map (not shown) of the entire L1340B cloud core, but for which we have ancillary data, including SCUBA maps at 450 and 850 microns (Figures 2a and 2b).

HARP Observations

We have mapped the entire one square degree of L1340 molecular cloud in 12CO J=3-2 using HARP at the JCMT in ~ four hours, achieving an RMS varying from 1.08 – 0.74K per 0.423 km/s channel (Figure 1). In addition we obtained a second map of part of this cloud region known as L1340B, which contains mainly on the 1340B cloud core, but for which we have ancillary data, including SCUBA maps at 450 and 850 microns (Figures 2a and 2b).

Bubbles or shells associated with B stars in HARP data

Figure 1: L1340 as seen by HARP in 12CO J=3-2 (integrated data from -17.4 to -12.3 km/s). L1340 is located in Cassiopeia at a distance of 600 pc. The cloud consists of three separate “clumps” as distinguished by CO observations, labeled A, B, and C (1). The red dashed box delineates the “deeper” map, mentioned in the Observations section. The yellow box shows the extent of the SCUBA maps (Figure 2).

Bubbles or shells seen in other L1340 data sets

Figure 2: SCUBA maps of L1340B at 450 and 850 microns (panel a) and HARP channel maps (panel b). Many of these dust cores show evidence of outflows, in CO and HI, indicative of an embedded protostellar population.

Results

We have mapped the L1340B cloud in 12CO J=3-2 using HARP at the JCMT, and have found intriguing bubbles and shell structures associated with some of the intermediate-mass stars which lie within the cloud boundaries. In addition, we have obtained ancillary CO and HI data that many of these cores harbor embedded protostellar objects driving outflows. Our SCUBA data also reveal a connection of dust cores associated with B stars to the bubble-like structures produced by these stars. We have used these observations to investigate the possible effects produced by these intermediate mass stars on structure in nearby regions.