DENSE CORES IN THE HH24-26 OUTFLOW REGION

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We have made observations of the (1,1) and (2,2) inversion lines of ammonia (NH_3) towards the dark cloud region containing the Herbig-Haro (HH) objects 24-27. These transitions are only excited at H_2 densities $>10^4$ cm^{-3}, and thus probe high density gas. From the observed hyperfine splitting one can calculate optical depths. The optical depth ratio can be used to determine the rotational temperature T_{21} which is equal to the kinetic temperature under dark cloud conditions.

With the 40" beam of the Effelsberg 100-m telescope we are able to detect a wealth of fine structure in the NH_3 distribution not seen in earlier lower resolution studies of the region (Matthews and Little 1983, Torrelles et al. 1983). Our map in the (1,1) line (see Fig. 1) shows a general elongation of the NH_3 emission in the N-S direction forming a ridge which connects the northern cluster of Herbig-Haro objects (HH24 A-D), the H_α emission line star no. 140, and HH25 and 26 with their exciting star, the embedded IR-source SSV59 (Strom et al. 1976). No enhancement in the NH_3 emission is seen towards HH27 which lies just outside our eastern map boundary.

Like HH objects, high velocity CO line wings are manifestations of outflow activity and Fig. 1 is an overlay of our NH_3 map and the CO high velocity emission detected by Snell and Edwards (1982) which suggests the existence of two distinct outflow centers in the region.

There is a conspicuous correlation of the ammonia emission peaks with the positions of the HH objects (except HH27) and the embedded IR-sources. There also is a local emission maximum near no. 140, the star which may be driving the northern outflow.

We have found evidence for an interaction of the outflow with the dense NH_3 clumps: A high S/N spectrum taken towards the position of SSV59, between HH25 and 26 shows evidence for broad line wings. Moreover, the linewidth towards the peak close to HH25 is significantly larger than towards neighbouring positions (1.0 km s^{-1} compared to typically 0.6 km s^{-1}). Also, the NH_3 rotational temperature at this position is higher than elsewhere in the cloud (15±1 K compared to 11-12 K).

A possible explanation for the enhanced temperature and broader lines towards HH25 is that these phenomena reflect the existence of an embedded heating source other than SSV59 which lies close to HH25. Evi-

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dence for this comes from the fact that two IRAS point sources are found in this area. Also, the 100 μm emission observed by Cohen et al. (1984) is extended in the same direction as our NH_3 and peaks on HH25.

Finally, it should be noted that the geometry of the region around HH25/26 is rather complicated and an assignment of the outflows to one of the IR-sources is by no means straightforward: Although the appearance of the double peaked NH_3 structure around SSV59 and its elongation perpendicular to the blue and red lobes of the southernmost CO outflow detected by Snell and Edwards (1982, 1984) resembles the type of interstellar disk proposed by some authors to explain the bipolarity of molecular outflows, one should keep in mind that the HH-objects which are "normally" aligned with the blue-shifted gas are in this case situated along a line perpendicular to the CO outflow axis.

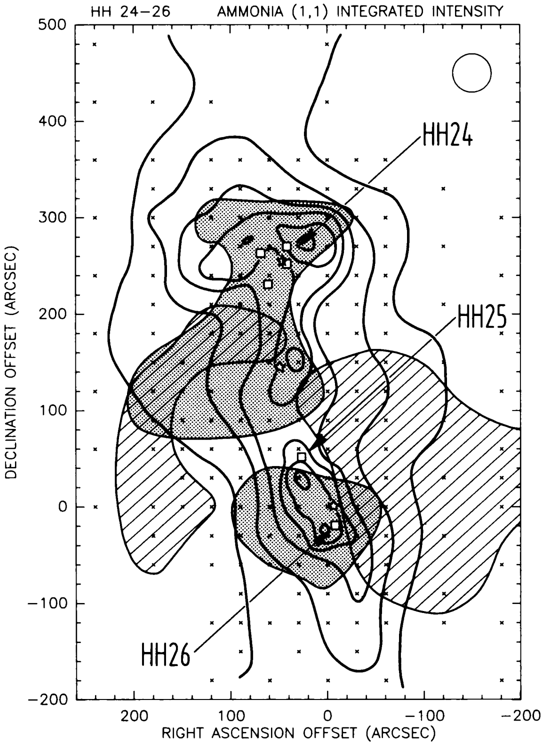

Fig. 1.: Map of the integrated $NH_3(1,1)$ main-beam brightness temperature. Coordinates of the (0,0) position are α_{1950}=$05^h43^m31^s.6$, δ_{1950}=$-00^o15'23''$. Measured positions are marked by crosses and the circle indicates the 40" telescope beam. The lowest contour is 0.7 km s^{-1} and the contour increment 0.8 K km s^{-1}. The extent of red- and blueshifted CO-emission (Snell and Edwards 1982, 1984) is outlined by hatched and dotted areas respectively. The IR-sources SSV 63, H_α 140, and SSV 59 (top to bottom) are denoted by stars and HH-objects by squares.

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