STAR FORMATION IN CHA T1

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ABSTRACT. In a region of 0.4 × 0.5 pc around HD 97300 the amount of mass in gas and dust is < 16 $M_\odot$, while the stellar mass is 6 - 9 $M_\odot$. Thus in this core of a collapsing cloud (Cha T1) several stars have been formed in a very efficient way.

1. OBSERVATIONS AND CALIBRATION

Centered on HD 97300 special high-resolution IRAS observations were executed: 4 with the smallest detectors at the edges of the survey instrument (EDGE), and 6 with CPC. Standard data reduction has resulted in calibrated EDGE maps (see Young et al. 1985) and CPC maps (see Wesselius et al. 1985). We have combined the maps, for EDGE and CPC separately (see Fig. 1). These observations have larger position errors than the IRAS Point Source Catalog (IPSC). Using the optical positions of stars detected at 12 and 25 μm the errors have been reduced to 5".

Table 1
IRAS sources around HD 97300

Our ID	RA m s	DEC ' "	Other Name	12 μm	25 μm	60 μm	100 μm
A	07 51	07 00		0.6 P	0.6 P	0.5 P	nd
B	07 56	17 39	HJM:C1-6,C1-3	0.8 D	8 D	13 D	
C	08 16	20 17	HD 97300	11.2 D	12 D	104 D	285 C
D	08 22	19 08	WW CHA, HM23	14.0 D	34 D	60 D	
E	08 26	16 12	HJM:C1-2	0.02 D	con	con	
F	08 33	13 35	JH16	0.5 D	0.7 P	nd	nd
G	10 53	27 59	HJM:E2-4	2.0 P	2.8 P	nd	nd
H	10 49	20 50	HJM:E1-9a	0.5 P	0.4 P	nd	nd

All objects are at 11^h, -76°, epoch 1950; C, E, P: flux determined from respectively CPC, EDGE, IPSC; no: not observed; nd: not detected; con: confused; HJM: Hyland, Jones, and Mitchell (1982); HM: Henize & Mendoza (1973); JH: Jones & Hyland (1986).

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In the confused region just around HD 97300 gaussians have been fitted to the apparent sources and the fluxes estimated are accurate to about 50 %; other source fluxes have about 10 to 20 % uncertainty. In Table 1 data on the sources found are summarized.

2. GAS AND STELLAR MASS

The formulae and constants presented by Hildebrand (1983) have been used, for a wavelength dependence of grain emissivity of $\lambda^{-1.5}$. The mass of gas and dust, derived using Hildebrand's eq. 10, is extremely dependent on the value of the temperature; the ratio of the fluxes at 60 and 100 μm indicates T = 50 K, leading to 0.1 $M_\odot$. At 0.5 pc from HD 97300 the dust temperature is of order 18 K; thus an upper limit to the dust+gas mass is 16 $M_\odot$.

For the (proto)stars B, D, E - confused with HD 97300 - the total luminosity is equal to the IR luminosity (including J, H, K) because of the heavy obscuration. For HD 97300 we use the mass estimate of Thé et al (1986). Total luminosity can be converted into spectral type and spectral type into mass using standard calibration tables for main-sequence stars. However, these pre-main-sequence stars may be superluminous (if by a factor 2.5, the mass estimate is 40 % too high). We arrive at a total mass of the stars B, C, D, E of 9 $M_\odot$.

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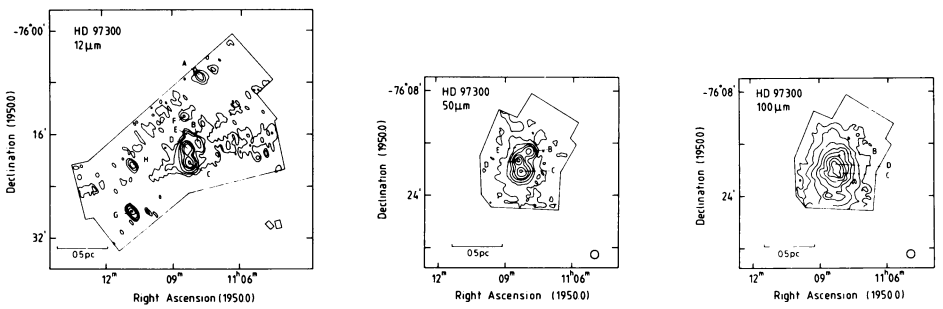

Maps at 12 μm(EDGE) and at 50 and 100 μm(CPC) are shown. 12 μm contour-levels at 1,2,4,10,20,40,100 10^{-7} $Wm^{-2}Sr^{-1}$; 50 and 100 μm levels at .14,.28,.56,1.4,2.8,5.6,14,28,56 and at 0.4,0.8,1.6,4,8,16,40 MJy Sr^{-1}.

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