SURVEYS OF THE 4.8 GHZ FORMALDEHYDE ABSORPTION LINE IN DARK CLOUDS IN M17 AND NGC 2024

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The 4.8 GHz H_2CO absorption line was mapped in the directions of the dark clouds in M17 and NGC 2024. The observations were made with a beamwidth of 6.6 arc min and a velocity resolution of 0.12 km s^{-1}.

In M17 two clouds at velocities of about 24 km s^{-1} and 19 km s^{-1} are mapped in antenna temperature T_A. The 24 km s^{-1} cloud, which shows deep and narrow absorption lines, is confined to the immediate vicinity of the radio continuum region. The shape and the peak positions of the cloud are in good agreement with those of the continuum distribution (Mezger and Henderson 1967). The optical depth of this cloud is generally uniform with a mean value of about 0.03. The cloud appears to be located in front of the radio source, as suggested by Lada and Chaisson (1975). The 19 km s^{-1} cloud, which shows wide line halfwidths ($\Delta V \gtrsim 3$ km s^{-1}), has its center at the darkest part of the foreground dust lane. The cloud has an elongated shape which corresponds to that of the dark lane. The equivalent widths in this cloud increase toward the northwest direction and the lines of constant equivalent width run parallel to the dark lane. The principal OH lines at 19 and 24 km s^{-1} also have similar distributions (Gardner and McGee 1971).

The contour maps of the antenna temperature in the space-velocity plane (Fig. 2a and b) show that the two clouds are connected and have a common outer envelope. The 24 km s^{-1} cloud appears to be smooth and narrow in the direction of the radial velocity. The 19 km s^{-1} cloud has an extension to the north where there also appears the peak, as seen in Fig. 2b. In both clouds there are velocity gradients in the directions to the north and to the northeast. The velocity gradients are $dV/d\delta$ = 0.1 km s^{-1} per min of arc for the 24 km s^{-1} cloud and 0.4 km s^{-1} per min of arc for the 19 km s^{-1} cloud. The velocity gradients seem to be the result of rotation of the clouds as there are no indications of cloud collapse. It appears that the 24 km s^{-1} cloud is actually larger than was detected in front of the HII region. This cloud is moving toward the HII region with a velocity of 7 km s^{-1}. The 19 km s^{-1} cloud is within the visible dark cloud in front of the HII region. It is moving toward the HII region with a velocity of 2 km s^{-1}.

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In NGC 2024 two clouds at velocities of 10 km s^{-1} and 13 km s^{-1} are detected. Both clouds have concentric circular contours with the centers at the positions of the radio continuum peak and the dark bar. It appears that the 10 km s^{-1} cloud is associated with the dark bar in front of the continuum source and the 13 km s^{-1} cloud is located behind the continuum source.

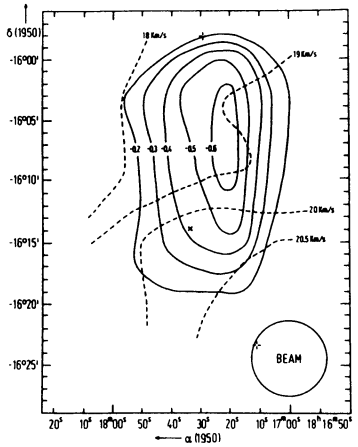

Fig. 1. Distributions of T_A and V_R of 19 km s^{-1} cloud in M17. X is the continuum peak position.

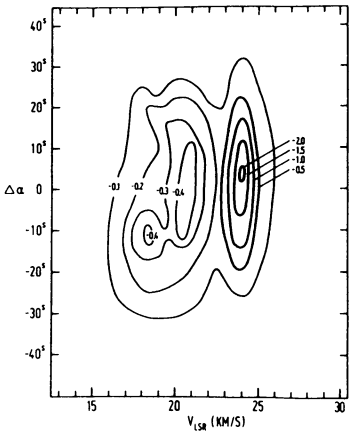

Fig. 2a. The contour map of T_A in the $\Delta\alpha$-V_R plane at $\delta(1950)=-16°15'$ in M17.

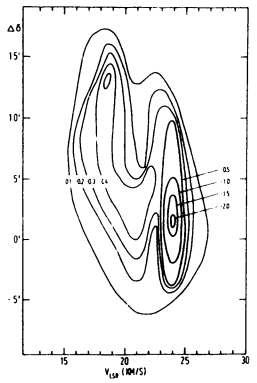

Fig. 2b. The contour map of T_A in the $\Delta\delta$-V_R plane at $\alpha(1950)=18h17m$ 40s in M17.

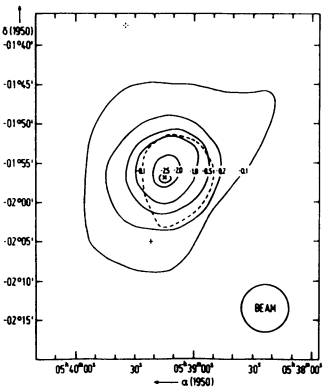

Fig. 3. Contour map of T_A of the 10 km s^{-1} (solid line) and 13 km s^{-1} (dashed line) clouds in NGC 2024.

REFERENCES

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