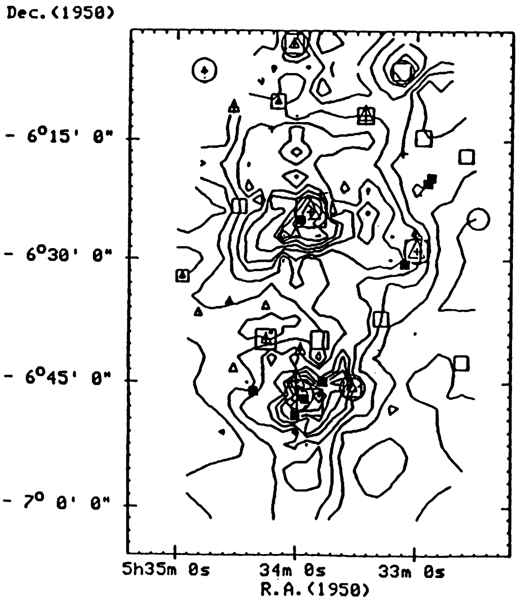

Fig. 1. $N(H_2)$ distribution in L1641. Contours are $3\times10^{21}\ cm^{-2}$ steps. HH-objects are denoted as ■ and IRAS sources are denoted as + (12 μm), □ (60 μm), O (100 μm), and Δ(25 μm).

AN OPTICAL POLARIZATION STUDY OF THE BOK GLOBULE B361

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B361 is an isolated, round-shaped globule in Cygnus. The results of FIR observations by Keene (1981) indicate that there are no internal heat sources while recent CO observations (Hirano *et al.* 1987) afford evidence for the existence of a few fragments in the core of the globule.

To obtain information on the evolutionary stage of B361 and on the role of magnetic fields in the globule evolution, we have made polarimetric observations of stars in the direction of B361 using the 74-inch and 36-inch telescopes of the Tokyo Astronomical Observatory. The distances for the program stars were adopted from Schmidt (1975) and Gottlieb (1978).

The dependence on distance of the Stokes parameters Q and U has been examined for 32 stars in the field or 2°×2° centered at the position of B361. Q and U for polarized stars increase abruptly at a distance of about 300 pc and remain constant (1.2 - 1.5%) between 300 and 700 pc, while almost all stars nearer than 300 pc are unpolarized.

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Polarization vectors of the stars at distances between 300 and 700 pc have been mapped. Significant polarizations are observed only for stars in the region of B361 or dark patches at about 1° NE of B361 on the POSS print. Polarization vectors are well aligned with each other and nearly parallel to the galactic plane in spite of the position of B361 (l = 89.3°, b = -0.7°) being just coincident with the direction of the galactic magnetic field in the local Orion arm (Vallee,1983).

The correlation length of galactic magnetic fields is typically 200 pc. If the observed polarization is due to magnetic alignment of grains and *if* those grains *were* uniformly distributed along the line of sight between 300 and 700 pc, the position angle of the polarization vector *would* be different from star to star, and Q and U *would not* remain constant *because* of the additivity of Stokes parameters (Chandrasekhar, 1960).

Therefore, it is suggested that (1) B361 and the adjacent clouds are responsible for the observed polarizations, (2) magnetic fields associated with those clouds are relatively uniform, and (3) the field direction is essentially parallel to the galactic plane and preferentially perpendicular to the line of sight.

Ratios of the degree of polarization (P) and the amount of extinction (Av) are derived for the stars lying just in the direction of B361. Derived values are smaller than 3 (%/mag) and consistent with the assumption of grain alignment by paramagnetic relaxation.

Figure 1 is a plot of P/A_V versus A_V. At A_V > 1 mag, ratios decreases with increasing A_V. This implies that the magnetic orientation of grains becomes less efficient in the core region of the globule.

According to Davis and Greenstein (1951), P/A_V is proportional to the degree of alignment Q_A of dust grains in the line of sight. For weak alignment, that is, when disorientation by collision with gas atoms works efficiently,

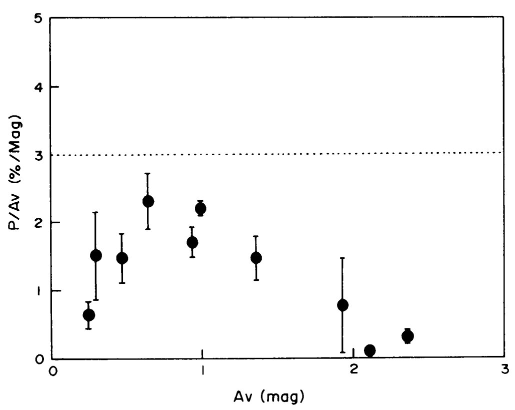

Fig. 1. P/A_V vs. A_V for stars nearby B361. P/A_V represents degree of alignment of grains in the line of sight.

$$Q_A \propto (B^2/n_{gas})(T_{gas} - T_{dust})/T_{gas}{}^{3/2}$$

where B is the magnetic field strength, n_{gas} is the gas density, and T_{gas} and T_{dust} are the temperatures of the gas and of the dust, respectively.

Provided that the magnetic field scales with the gas density as $B \propto n_{gas}{}^{\alpha}$, $n_{dust} \propto A_V$, the P-to-A_V ratio may be written as

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$$P/A_V \propto A_V^{2\kappa - 1}$$

for isothermal clouds with $T_{gas} \neq T_{dust}$. Therefore, the decrease in P/A_V with increasing A_V indicates that the value of κ is below 1/2 in the core region.

Alternatively, the difference in temperature between gas and dust may be reduced in the core, or the grain growth might be followed by an increase of the population of spherical grains relative to nonspherical ones with increasing gas density.

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THE LYNDS 204 COMPLEX: MAGNETIC FIELD CONTROLLED EVOLUTION?

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The L204 dark cloud complex is a highly elongated structure stretching over 4 degrees in declination. Its total mass is 400 $M_\odot$ with the more tenuous sections of the cloud being displaced in right ascension from the more heavily obscured parts.

We have observed J = 1-0 and 2-1 ^{12}CO and ^{13}CO emission over the complex and have also made optical polarization measurements of background stars along the length of the cloud. The CO radial velocities exhibit gradients along the length of the complex which mimic the variations in the mass distribution, and the polarization $\vec{E}$ vectors suggest that L204 contains a magnetic field predominantly perpendicular to its long dimension (assuming that the Davis-Greenstein mechanism is operative). These observations suggest that some external impulse acted on the complex over a large angular extent and that the subsequent evo-

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