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Observing 3-D Magnetic Field Structure in DR21(OH) Core

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We present evidence for the cyclotron interaction effect at arcsec scale on the velocity dispersions in the spectra of ion/neutral molecular species in DR21(OH) observed with the OVRO-MMA. It has been suggested that under average interstellar field strengths the cyclotron interaction between the ions and magnetic fields are strong enough to narrow the linewidth and suppress the line wings in the ion spectra compared to neutral species (Houde et al., 2000, ApJ, 536, 857). This effect provides a valuable probe to study the structure of magnetic fields in the cores. The cyclotron interaction provides a measure of the angle between the magnetic field direction and the line of sight, and therefore, it is complementary to conventional polarimetry, Zeeman splitting (measure of the line of sight component) and dust emission (projected magnetic field geometry). In the OVRO data, currently available, we see some evidence for the cyclotron interaction in the DR21(OH). The ion H13CO+ linewidths are narrower than the neutral H13CN linewidths. The small beam size (3 - 5 arcsec) of the interferometer spectral line maps enables us to resolve the velocity structure and the chemical differentiation across the core. We discuss the analysis and interpretation of the differences in the widths and the shapes of the ion/neutral spectral lines in DR21(OH) core. We use the cyclotron interaction inferred from the ion/neutral spectral lines to derive the 3-D magnetic field structure of DR21(OH) at arcsec scales by combining with the existing Zeeman measurements (Crutcher et al., 1999, ApJL, 514, L121) and dust/CO polarimetry data (Lai et al., 2003, ApJ, in press).

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