Mapping the magnetic field structure of massive star-forming regions through molecular line polarization

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The major problem of the most commonly used method for probing magnetic fields, the dust polarization observation, is that it is incapable of differentiating the field structure along the line of sight. Since every molecular transition has a particular critical density, measuring the molecular line polarizations, the Goldreich-Kylafis effect (GK effect), provides a unique way to probe the three-dimensional structure in star-forming regions. We have participated in the Submillimeter Array (SMA) polarization Legacy Project and have obtained polarization data from multiple molecular lines toward several massive star-forming regions. By analyzing these data, we may be able to decouple the magnetic field structure of these regions along the line of sight. The results will help us apply for ALMA time in the future.