

Probing the magnetic field structure in star-forming regions through molecular line polarization

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 cores. Although currently it is very difficult to measure GK effect, the Acatama Large Millimeter/submillimeter Array (ALMA) will potentially enable routine observations of GK effect. We have developed a preliminary computer program for modeling molecular polarization with uniform magnetic field and velocity gradient. Students can choose to (1) use the current program to model the expected results from ALMA for simple physical models or (2) expand the function of the program for non-uniform magnetic field structure.