Polarization of protoplanetary disks and YSOs at mid-IR

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There are still many unknowns about the role of magnetic fields in regulating the dynamics and evolution of young stars. Polarimetry, which is an important observational technique to study magnetic fields, has demonstrated its potential to map out the morphology of projected magnetic fields on the plane of the sky.

We present the high-resolution (~0.3") mid-IR polarimetry observations of protoplanetary disks around Herbig Ae/Be stars and massive star formation regions in the northern hemisphere, using the mid-IR facility GTC/CanariCam. Our goal is to understand the polarization mechanisms, constrain the dust properties, and infer magnetic fields directions in disks and young stellar objects. Among the sample, WL16, which has an unusually extended protoplanetary disk, locates at ρ Ophiuchus molecular cloud with interstellar visual extinction of 28 mag. We find that the polarization towards the object is dominated by the absorptive polarization with polarization efficiency $(p/tau)_{10.3}$=1.0%. W51 IRS2 region is one of the most luminous massive star-formation regions in our galaxy. Polarization mapping of the W51 IRS2 cluster shows complicated structures and seems to be associated with the outflow ejected from W51 North. Combined with sub-mm observations, we are able to understand the mechanisms that produce observed polarization in this region. This research was supported in part by NSF grants AST-0903672 and AST-0908624 to CMT.