

Polarization Studies of Interstellar Clouds

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Measurements of polarized emission are often regarded as highly challenging, due to issues of sensitivity, execution and complexity of interpretation. This is particularly true for interferometers, since systematic effects can affect polarized and total intensity data differently. However, polarimetry has been regarded as increasingly important in the study of interstellar clouds as our understanding of the rôle of magnetic fields in the formation and evolution of clouds has progressed. Recent measurements have revealed evidence for ordered magnetic fields on scales both larger and smaller than a single core, and the development of magnetized models for filamentary clouds and collapsing cores has also provided a means to better interpret polarimetry observations, particularly on moderate parsec-scales within molecular clouds.

I will review the existing body of millimeter polarization work on interstellar clouds and star formation with particular emphasis on the results from the Berkeley-Illinois-Maryland Association (BIMA) array, which has done the majority of high resolution polarimetry. Based on BIMA's results and predictions of star formation theories for the formation of disks and outflows, we should expect significant contributions to our understanding of magnetic fields from the new class of millimeter interferometers: the Sub-Millimeter Array (SMA); the Combined Array for Research in Millimeter Astronomy (CARMA); the Atacama Large Millimeter Array (ALMA); as well as the Australian Telescope Compact Array (ATCA) which was recently fitted with 3mm receivers. I will emphasize the particular niches each of these telescopes will fill in frequency, resolution and sensitivity, and how each will contribute through its particular strengths to our understanding of magnetic fields in molecular clouds and star formation.

If time permits, I will explore the potential for these instruments beyond their initial design, such as the SMA's potential combination with the James Clerk Maxwell Telescope, and the implementation of dual-beam polarimetry for CARMA. I will also discuss the many benefits of investing in single dish instruments to provide short spacings information missing from interferometric maps and why this is so important for polarization observations in particular.