

Interstellar magnetic fields

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Magnetic fields are an essential piece of the interstellar puzzle, entangled with the structure, dynamics, and energetics of interstellar matter. However, despite of their importance, due to the paucity of data, magnetic fields have long been the least studied component of the interstellar medium (ISM). This situation is rapidly changing thanks to major steps forward in observational capabilities.

Radio polarization observations have delivered data that have been used to map magnetic fields on galactic scales. More recently, Planck provided us with all-sky maps of dust polarization characterizing the structure of the turbulent component of interstellar magnetic fields and their coupling with interstellar matter, with unprecedented sensitivity and statistics. Today, the precursors to the Square Kilometre Array (SKA), especially the low frequency array (LOFAR) in Europe, reveal an array of newly discovered structures in the diffuse magnetized ISM, through Faraday tomography. At the same time, the Atacama Large Millimetre Array (ALMA) is opening the path to studies of magnetic fields along the star-formation sequence from pre-stellar cores to proto-stars and their proto-planetary disks.

I will review these different perspectives on interstellar magnetic fields, highlighting key results and prospects of on-going and future research.