MONTANA STATE UNIVERSITY | College of LETTERS & SCIENCE | Physics Colloquium

Friday, October 21st
4:10 – 5:00 PM
Barnard Hall 103

On Inverting Solar Coronal Vector Magnetic Fields From Infrared Observations

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Abstract:

Currently, magnetic fields in the lower solar atmosphere are routinely measured through the Zeeman effect. Due to the very small level splittings of highly ionized coronal species that require gargantuan instrumentation, measurements of the full magnetic vector in the higher layers, such as the corona have been hard to achieve. The need for inverting magnetic fields from solar spectropolarimetric observations is crucial, as the next generation of coronal capable instruments like DKIST Cryo-NIRSP, DL-NIRSP, and UCOMP will become operational. We present an algorithm capable of inferring coronal vector magnetic field information by inverting observations of polarized light. The Coronal Line emission DataBase inversion (CLEDB) implements two branches that can process Stokes spectropolarimetric observations of one or two coronal emission lines. The 1-line branch uses analytical approximations to derive line of sight integrated magnetic fields. By posing the 2-line inversion problem, we can allow for additional constraints. Theoretical calculations stored inside a database can be used to gain intrinsic access to otherwise non-observable input parameters, e.g. atomic alignment, scattering geometry, etc. that can be used to break inherent degeneracies encountered when attempting analytical inversions like in the 1-line case. Thus, by utilizing 2-line Stokes observations, we show how we can remote-sense the 3D magnetic fields and volumetric locations of emitting structures for single-point voxels. We additionally explore separating the problem into two parts: i. Disentangling the magnetic field orientation by using the newly developed CLEDB framework; ii. Estimate the magnetic field strength without resorting to Stokes V measurements; e.g. from magnetically-induced Doppler plasma oscillation, and discuss potential applications.

Host: Charles Kankelborg

**** Refreshments served in the Barnard second floor atrium at 3:00 P.M.***