

Space Science Seminar
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Optimizing Spectroheliogram Deconvolution Methods : MaGIXS - A Case Study

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Host: Dr. Alphonse Sterling (Sponsored by ST13)

The Marshall Grazing Incidence X-ray Spectrometer (MaGIXS) sounding-rocket mission proved the long abandoned slitless imaging spectrometry to be promising in tackling the challenge of understanding the complex dynamics of the coronal plasma heating events. Indeed, the spectroheliogram contains both spatial and spectral information collected simultaneously over a large field of view (9.5' x 25'). MaGIXS observed several strong emission lines (from ~9 to 30Å) from different portions of two active regions. Depending on the size of the extended source combined with the extent of spectral dispersion, there will be locations in the focal plane where spectral lines from different spatial locations overlap and must be deconvolved. An unfolding method has been successfully developed and demonstrated on the first rocket flight MaGIXS. The inversion invokes several variable hyperparameters to unfold the spatial-spectral overlaps. In the present work, we optimized this method, especially by conducting a systematic investigation of the hyperparameters that controls the inversion. We also demonstrate two different modes of inverting spectroheliogram data, one that relies on inverting all ion simultaneously (akin to standard emission measure inversions) and another that inverts single ions alone and does not require previous assumptions on the thermal and ionization equilibrium and abundance state of the plasma.

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