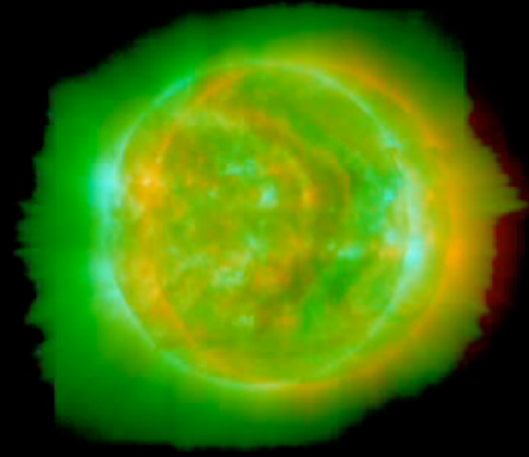


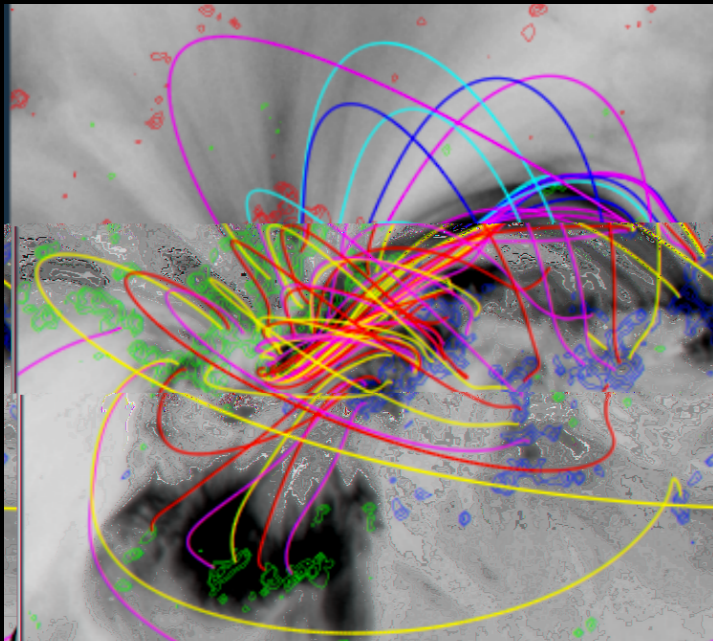
DOC-FM: Data-optimized coronal field model

MHD-model based approach
to forward-fitting the global field

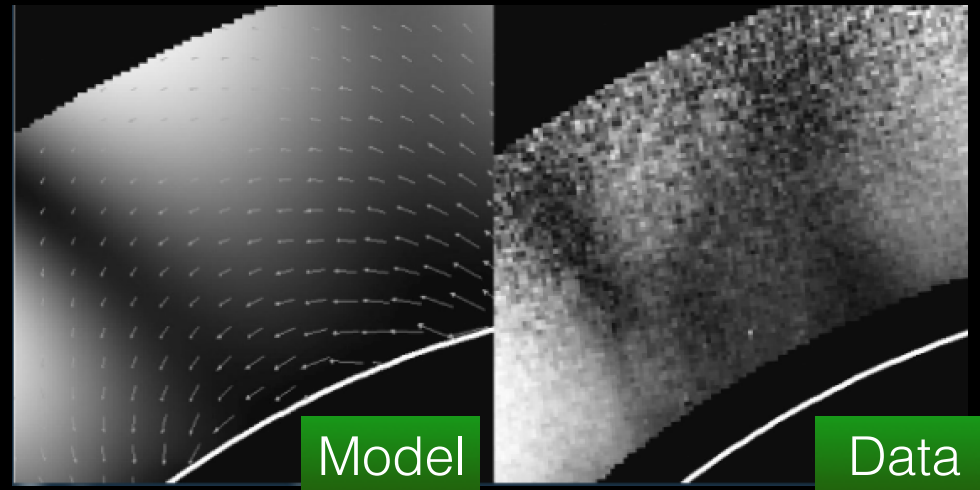
1) Initial guess global magnetic field



4) Solve for best fit parameters
(location, orientation, strength,
height of inserted flux ropes).



2) Generate synthetic observables



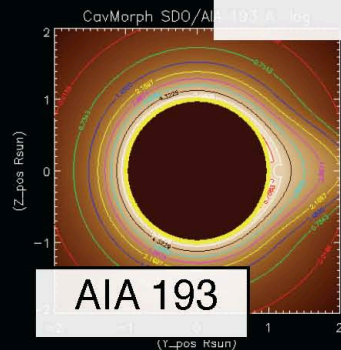
3) Add currents (flux-rope insertion) where
synthetic observations don't match data

FORWARD modeling

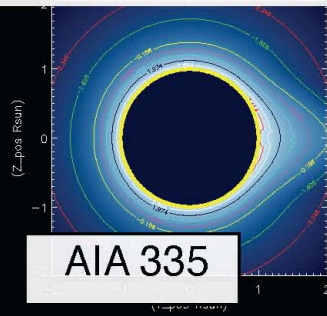
First step in any inverse method: a well-defined forward problem

“FORWARD” SolarSoft IDL Codes

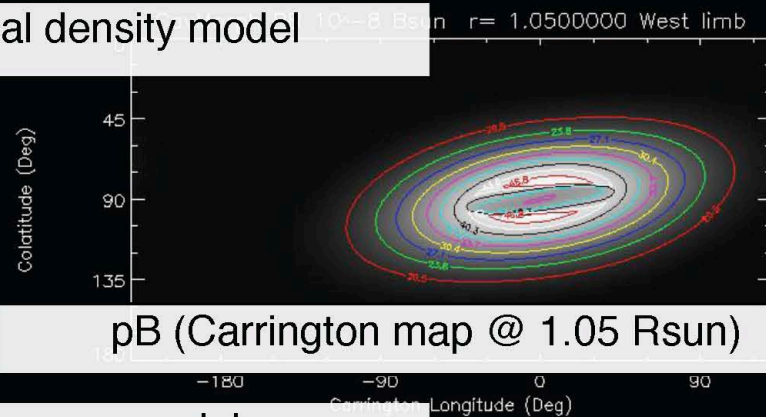
“Cavmorph” morphological density model



AIA 193

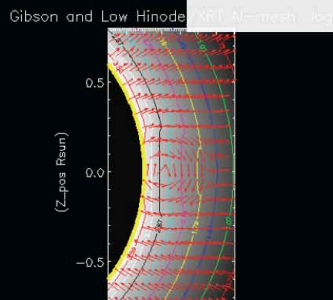


AIA 335

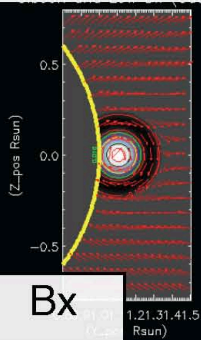


pB (Carrington map @ 1.05 R_sun)

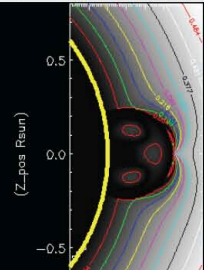
Gibson&Low MHD flux rope model



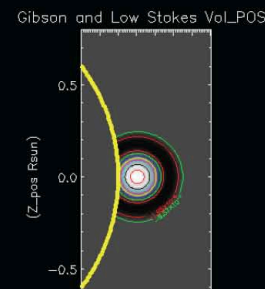
XRT Al-mesh



Bx



linear polarization



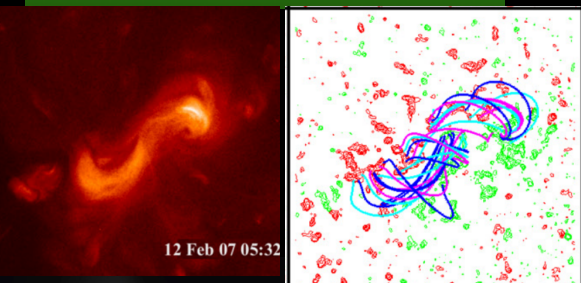
circular polarization

Given a distribution of plasma and magnetic fields along the line of sight, synthesizes observables (including polarimetry) from radio to SXR wavelengths

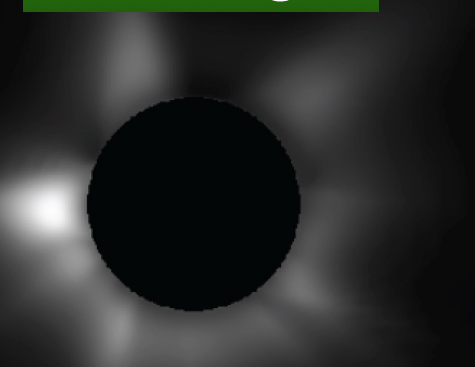
Coming soon: UV spectropolarimetry (Fineschi), Faraday rotation (White)

Observations

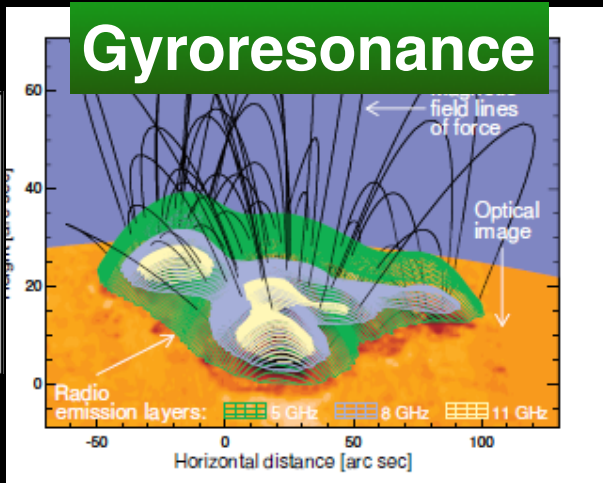
EUV/SXR loops



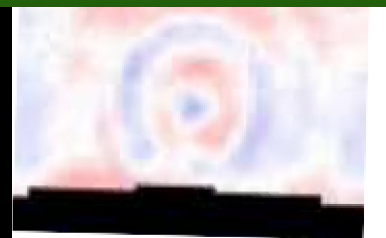
White light



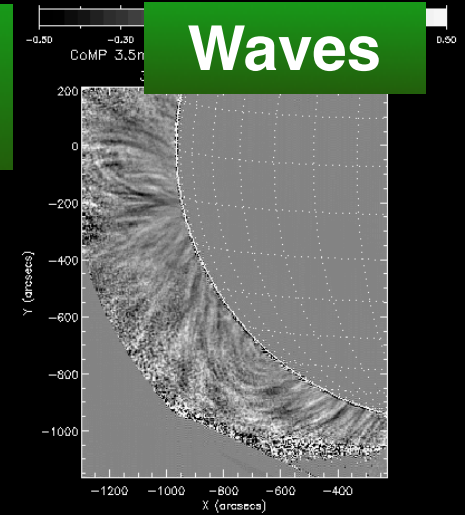
Gyroresonance



Vlos structure

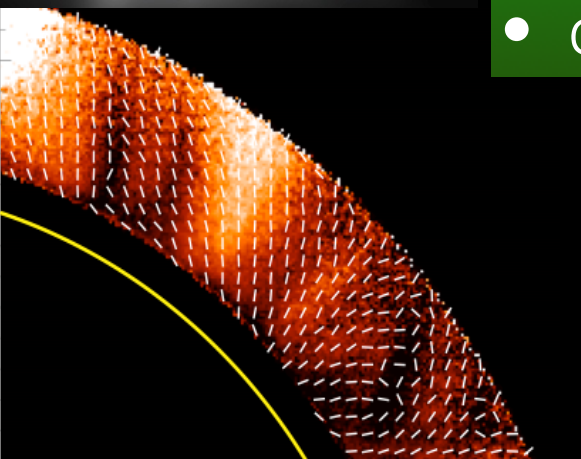


Waves

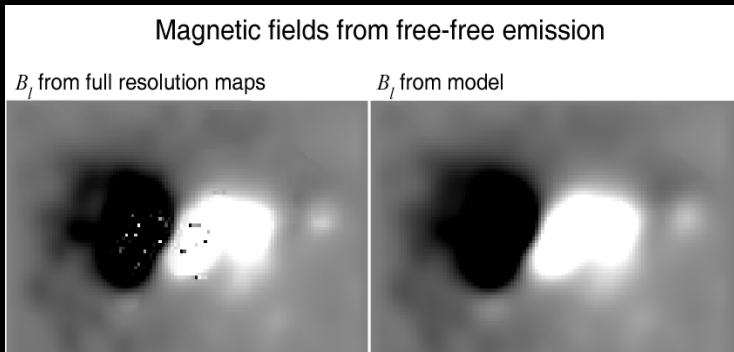


Multi-wavelength data have complementarities:

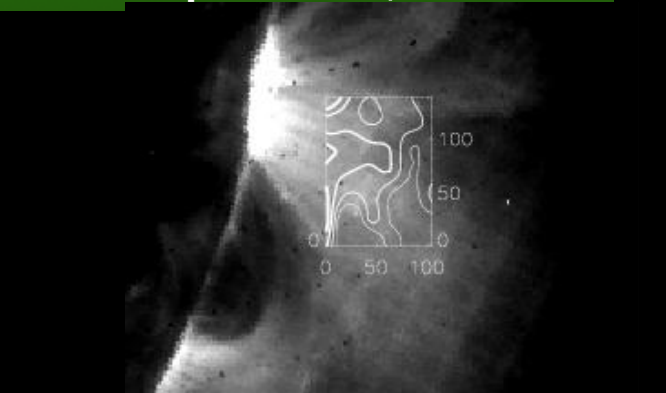
- disk vs. limb, strong field vs. weak field
- different sensitivities to plasma along line of sight
- different parts of vector field (B_{los} , B_{pos} , $|B|$)



Linear polarization (Fe XIII)



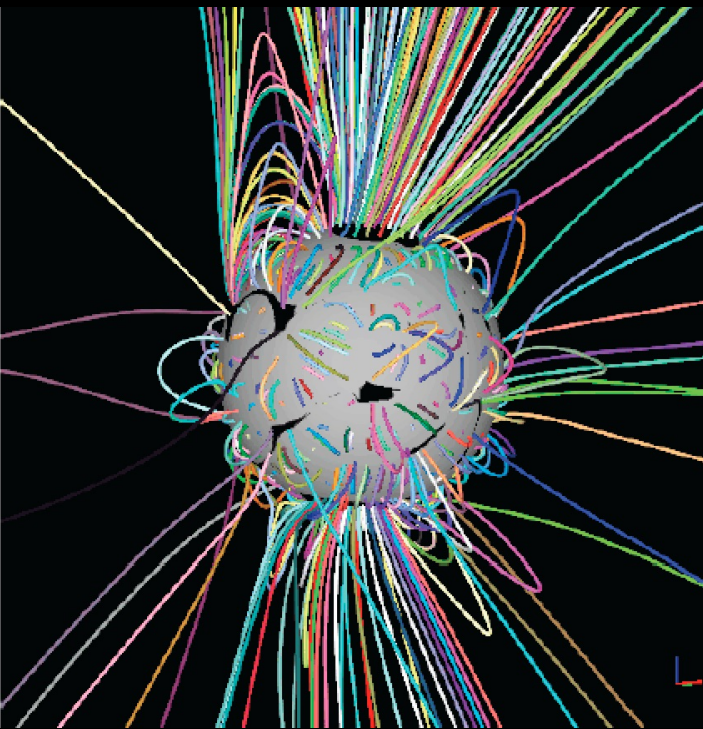
Thermal Bremsstrahlung



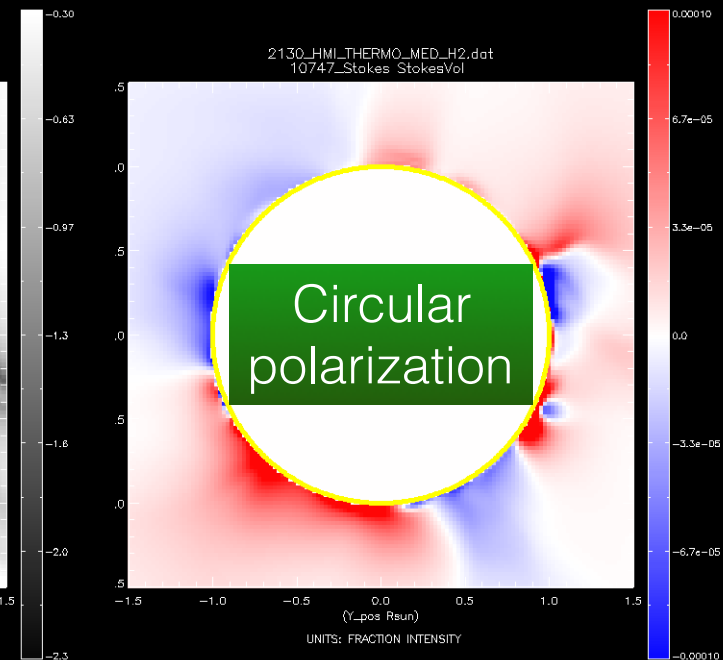
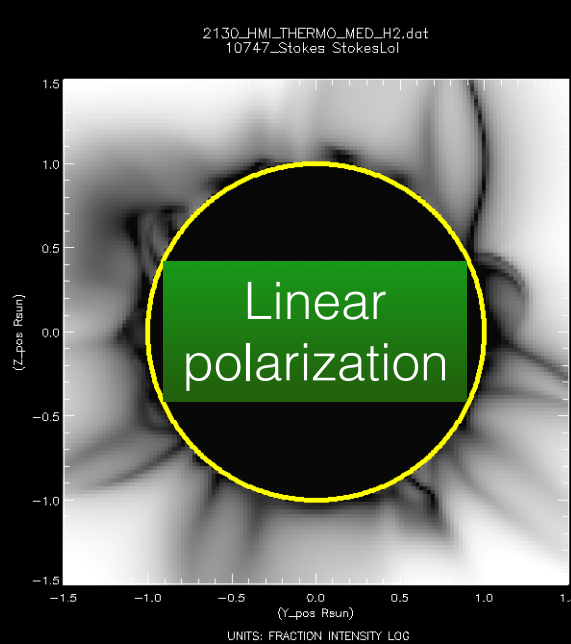
Circular polarization (Fe XIII)

Synthetic test beds

Include both currently existing and potential future observations (that have well-defined forward calculation)

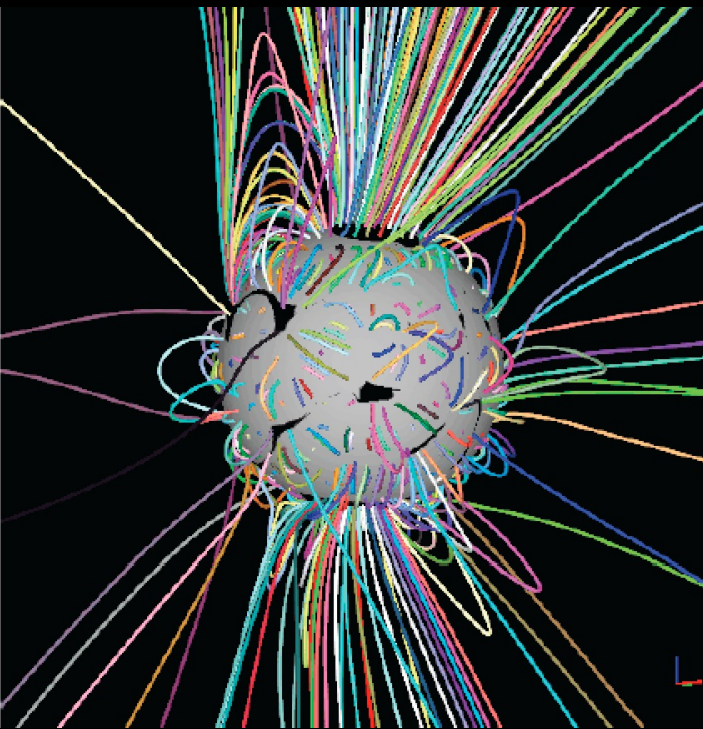


Fe XIII

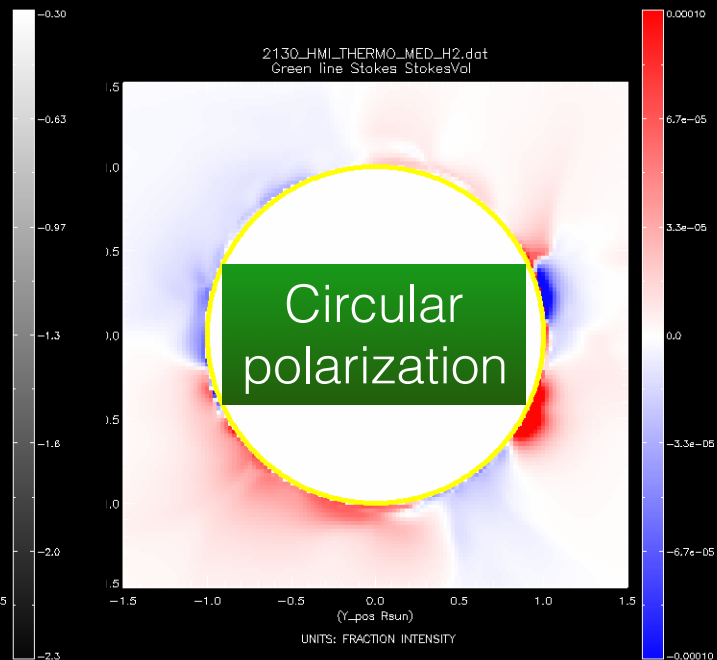
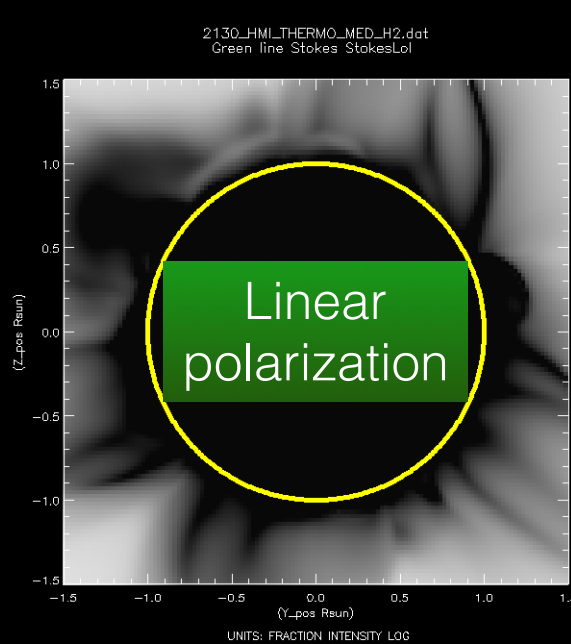


Synthetic test beds

Include both currently existing and potential future observations (that have well-defined forward calculation)

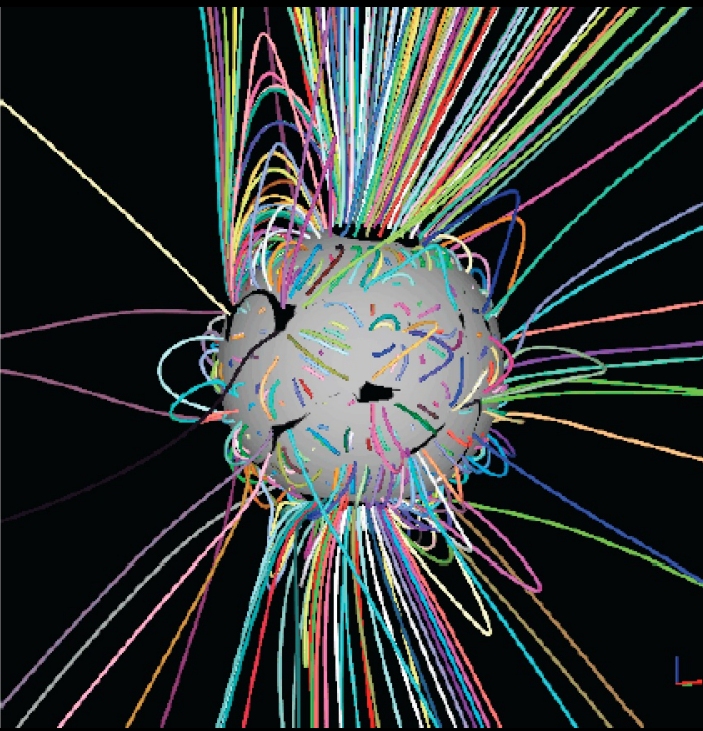


Fe XIV

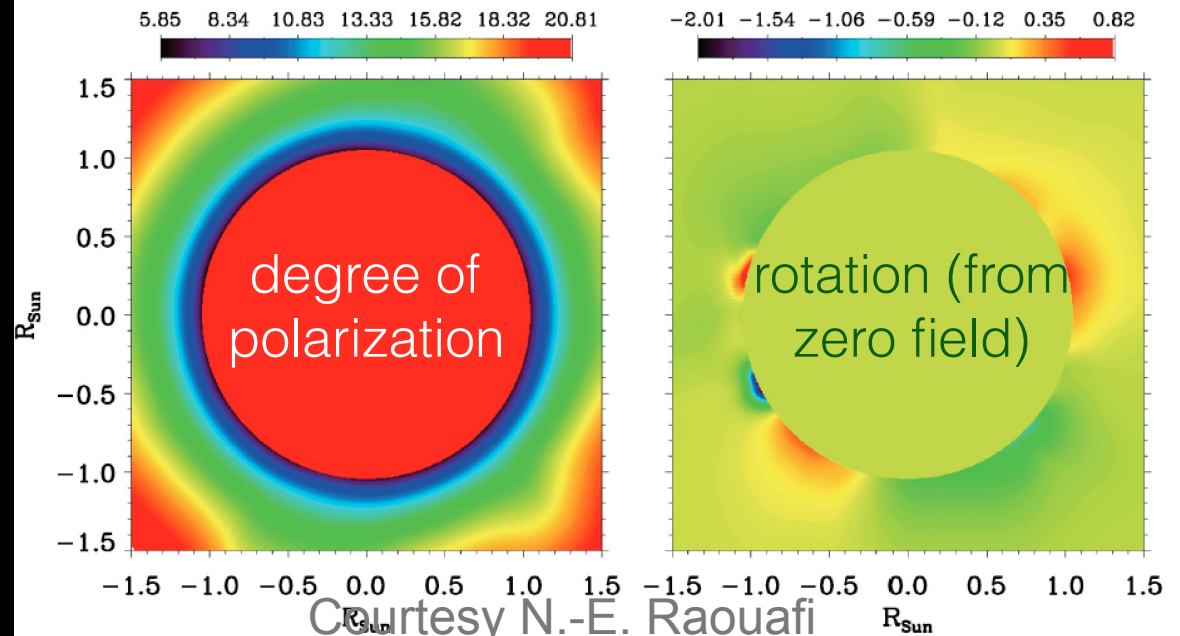


Synthetic test beds

Include both currently existing and potential future observations (that have well-defined forward calculation)



Ly- α Polarization



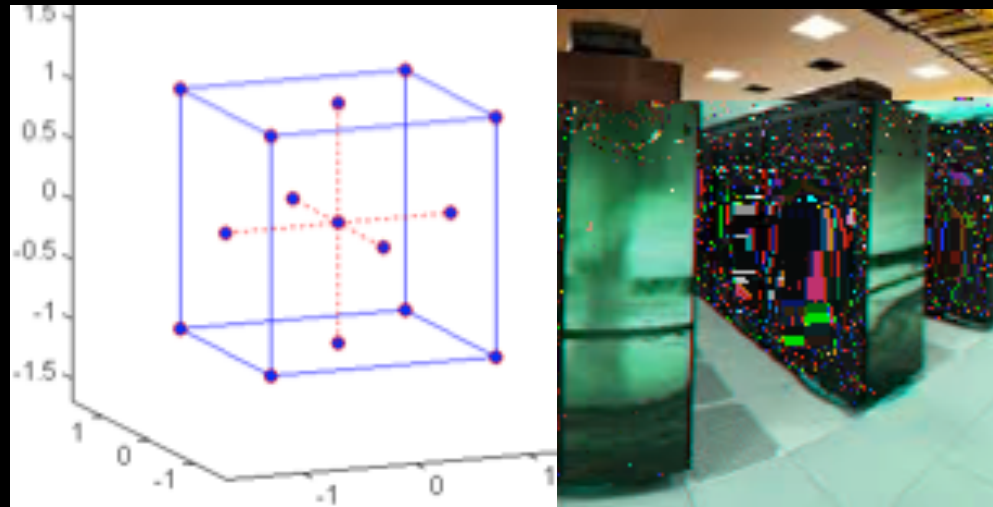
Courtesy N.-E. Raouafi



Combining multi-wavelength observations

constrains the global solution more tightly and reduces the need for using coronal rotation to compensate for line-of-sight ambiguities.

Optimization methods (HAO-CISL collaboration)



Design efficient methods for searching parameter space

Take advantage of “embarrassingly parallel” aspects of the problem

Effectively utilize different sensitivities to different observations.

Solve for statistical ensemble of maximum-likelihood solutions with associated uncertainties

Applying these methods to synthetic test-beds allows us to seek the optimum set of observations to constrain the problem