Metcalf Travel Award for Laurel Rachmeler, HAO Postdoctoral Fellow
SDO4, IRIS, Hinode Workshop, March 12-16, 2012

Laurel Rachmeler has just completed a 2-year postdoc at the High Altitude Observatory a division of NCAR in Boulder, Colorado. She is beginning a second postdoc at the University of St. Andrews in April of 2012. She holds a BA in Physics from Bryn Mawr College, and an MS and PhD in Astrophysics from the University of Colorado at Boulder. Her research focuses on the magnetic nature of the solar corona, specifically the magnetic field associated with solar eruptions.

Contributed talk: Forward modeling of coronal polarization

The Coronal Multichannel Polarimeter (CoMP) is an instrument which measures, among other things, linear polarization in the Fe XIII 10747 Å coronal emission line. These measurements directly probe the magnetic field in the corona. The corona is dominated by magnetic fields, but they are very difficult to measure. CoMP uses one of the only known methods of actually measuring the coronal field.

Our research group has been using a forward approach to study the magnetic field morphology in coronal cavities. This forward approach works by calculating synthetic CoMP-like polarization data from numerical models of the corona. These forward-calculated images can then be compared with solar observations to see if any of these observations match our models. We have chosen to concentrate on coronal cavities. A coronal cavity is a density depletion (around 50%) that surrounds a prominence. A prominence is an elongated dense, cool structure of primarily chromospheric plasma that exists in the corona. The magnetic structure of prominences is not well constrained. All prominences, when seen at the solar limb and oriented along the line of sight, show these cavities surrounding them.

We previously observed a cavity in 2005 with CoMP that was consistent with a specific type of twisted magnetic structure called a spheromak flux rope (Dove et. al. 2011). Since then, we have expanded the number of model cases and the number of observations in our study. At this workshop, we presented initial work that compared forward model data from a 3-dimensional cylindrical flux rope with observations of dozens of cavities. The cavities are often observed to have two dark near-radial lines in linear polarization known as Van Vleck inversions and a smeared dark area. We see that the top of this dark area corresponds well to the center of the cavity, which is indicative of a flux rope axis. Thus, all of these observed cavities are consistent with the 3-dimensional cylindrical flux rope model.

CoMP is taking data on a daily basis which is providing a wealth of measurements that probe the magnetic nature of the corona. These measurements are beginning to produce scientific results, but we have only just begun to scratch the surface.