**Automatic CME Leading Edge Detection for SMEI and HI**

Christina Burns, University of Michigan - Ann Arbor
Mentor: Dr. Tim Howard, Southwest Research Institute

A coronal mass ejection (CME) is a large magnetic plasma bubble that is ejected from the sun over several hours. These can cause severe geomagnetic storms at Earth so it would be ideal to predict when these CMEs will impact Earth. The program we created can automatically detect the leading edge of a CME observed by heliospheric imagers and use that information to predict when the potentially damaging CME will impact Earth. We created a program for two instruments, the Solar Mass Ejection Imager (SMEI) aboard the Coriolis spacecraft and the Heliospheric Imager (HI) aboard both STEREO spacecrafts. We used the Hough Transform, a mathematical image processing tool, to pick out the CMEs in both programs. The SMEI program, CLEDS, takes SMEI images as inputs and picks out the leading edge of the CMEs and also the end points of the noise regions. The SMEI images are very noisy, so we had to take into account the noise regions because some CMEs could be hiding behind the noise regions. The HI program, CLEDHI, takes HI images as inputs and is able to pick out a CME from the set of images. The noise gaps are not necessary for the HI version because the images are nowhere as noisy as the SMEI images. The outputs of CLEDS and CLEDHI are then fed to the Tappin-Howard (TH) model to carry out a prediction of when the CME will impact Earth. These programs run automatically so the ultimate goal would be to run these programs each time a new image comes down from the imagers, 101 minutes for SMEI and 120 minutes for HI. This would create a new prediction of CME impact every time a new image comes down, making the prediction more accurate and the model a useful space weather forecasting tool.