

Title: Using NOAA and MWO Sunspot Data to Investigate the Impact of Joy's Law Tilt on Simulations of Solar Cycle 22 with the Advective Flux Transport Model

Student: Blaire Ness (Stony Brook University)

Mentors: Lisa Upton (HAO), Andres Munoz-Jaramillo (SwRI), and Ricky Egeland (HAO)

Abstract:

The Advective Flux Transport (AFT) model is a surface flux transport model that simulates the evolution of the Sun's magnetic field through meridional flow, differential rotation, and convection. The NOAA active region dataset and Mount Wilson Observatory sunspot dataset were combined to create a dataset that accounts for both an active region's flux (calculated from NOAA area data) and its tilt relative to the equator (extrapolated from MWO location and polarity data), known as Joy's Law tilt. AFT was first run for Solar Cycle 22 using only NOAA active region data and an average Joy's Law tilt as its input. The MWO dataset was then used to calculate the actual tilts of these active regions, and AFT was then run with this updated tilt information. The resulting magnetic maps from AFT were used to calculate timing of the polar field reversal in the different simulations, as well as to generate magnetic butterfly diagrams. I will compare the results of these simulations and show how the addition of observed tilts of the active regions impacts these results.