

Solar Acoustic Energy Transfer through Magnetic Features

Jonathan Olsten

Maui Scientific Research Center

Research Supervisor – James D. Armstrong

Home Institution: Purdue University

The “Coronal Heating Problem” describes the phenomenon that is the temperature of the solar corona: the atmosphere surrounding the sun has a temperature about 200 times that of the solar surface. This is not only counter-intuitive, but also violates the 2nd Law of Thermodynamics. The goal of this project is to compare data obtained from the Magneto-Optical Filters at Two Heights (MOTH) project to data and theory described by Braun et al in *The Absorption of High-Degree p-Mode Oscillations in and around Sunspots*. Specifically, it has been observed that acoustic waves have propagated beyond the solar surface via magnetic features when they otherwise shouldn't be able to do so. The acoustic cutoff frequency for waves propagating through the inner solar surface is about 5.4 mHz, but waves at 4 mHz have been observed traveling through magnetic features. It is possible that these waves, which break the local speed of sound and release energy in the form of shock waves and heat, are a significant contributor to the relatively hot corona. In order to measure the energy warming the corona, the energy in the acoustic waves traveling both in and out of the sunspot can be measured. Essentially, the difference yields the amount of energy, in the form of transverse waves, which may be propagating through the magnetic feature into the solar corona. It is interesting to note that the temperature of the corona rises as the number of magnetic features rise and falls as the number of magnetic features falls as it follows the sunspot cycle. Results have recently been produced but have not yet been fully analyzed. If it is determined that the energy discharged as a result of the presence of the magnetic features is sufficient to sustain the corona, then the “Coronal Heating Problem” may be one step closer to being solved.