

Austin Monaghan(Colorado School of Mines)
Mentor: Dr. Paul Bryans, HAO [NCAR/UCAR]

A Closer Look: Novel Measurements of Coronal emission-line and white-light Polarization during the 2019 Total Solar Eclipse in Chile

Abstract:

Physical features of the solar corona such as temperature, density, and magnetic field, have been demonstrated to affect the polarization of coronal light making polarimetry one of the most crucial diagnostic tools for research. Although the history of polarimetry in solar physics is long, the ever-advancing world of technology continually provides opportunities for implementation with new instruments and new methods. The pursuit of new measurements could shed light on long-standing unsolved problems of the solar corona, and increase our understanding of the corona, solar weather, and our sun. The PolarCam snapshot micropolarizer camera from 4D Technologies could hold the potential for novel exploration of the solar corona. Developed for use in interferometric measurements, the PolarCam is sensitive to linearly polarized light on a pixel scale and has the unique potential for size- and weight-constrained measurements such as CubeSat deployment. Similarly, the relatively unexplored Si X emission line (1.43 microns) could provide novel measurements of the solar corona, and shows great promise for magnetometry.

The 2019 Total Solar Eclipse in Chile provided an opportunity for the exploration of the Si X line as well as an investigation into the potential of PolarCam and similar technology. A team from the High Altitude Observatory (HAO) in Boulder observed the eclipse from Cerro Tololo Inter-American Observatory, taking measurements of Si X (1.43 micron) and white-light (734 nm) polarization. PolarCam observations, taken during total solar eclipse, were quantitatively compared with ground-based white-light coronagraph measurements, demonstrating the capabilities and limitations of such a detector for coronal measurements. The instrument's potential for future deployment in expeditions or cubesat missions is also evaluated. Finally, preliminary data from the Si X experiment is presented and possible avenues for further exploration are proposed.