Preparing for the April 2024 Total Solar Eclipse with The Citizen CATE Project

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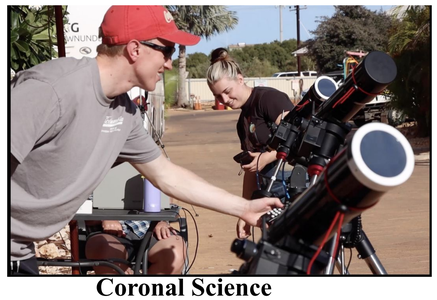
Project Overview (Abstract): The **CATE 2024 project will produce next-generation polarized observations of the solar corona during the April 8th, 2024, total solar eclipse (TSE)** that will cross the continental U.S. These observations will be made by 35 teams of citizen scientists along the path who will gather continuous images of the lower and middle solar corona. The recruited teams will consist of students and amateurs whose **collective observations will be combined into a 1-hour-long movie of the solar corona.** The polarization data collected will answer questions such as determining connectivity in the solar corona, measuring the nascent solar wind flow, and identifying and characterizing reconnection in the middle corona.

During the summer of 2023, we mapped out potential rural, urban, and tribal communities surrounding target CATE 2024, observing sites as possible citizen scientists for our project. **We focused on underrepresented communities.** We also **tested and characterized observing setups,** specifically cameras that will be distributed to the teams along the path of the TSE, as well as telescope equipment and software. During analysis, we characterized each of the cameras' four polarization channels to analyze their performance and suitability for the high dynamic range imaging required for the CATE 2024 project. Based on the individual performance of different camera models, one will be chosen to be distributed in bulk across the teams. We found that the camera and telescope equipment meet all requirements, approving them for the 2024 TSE. Currently, we are **preparing to begin recruitment for the community teams and are creating teaching materials** that will be used as a universal training curriculum for our volunteer observers. We will present the results of our outreach planning and recruiting plans and expand on the characterization process of our equipment and plans for the CATE 2024 project.

Citizen CATE 2024

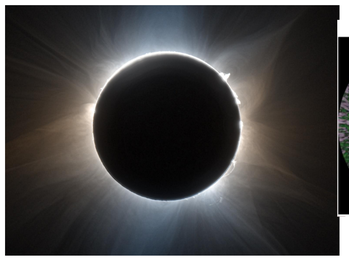
Goal

The totality phase of the eclipse will last for about 2-4 minutes at each site, the combined Citizen CATE Experiment data set will reveal for the first time how this part of the solar atmosphere changes during 60 minutes. New scientific results about the dynamics of the magnetic fields and plasmas in this part of the solar corona will be derived from the data, and the image sequence will provide a beautiful perspective of the solar eclipse as never seen before.



Coronal Science

Because total solar eclipses last only a few minutes at each location, these types of studies are impossible unless data from several eclipse locations are combined. The polarization data collected will answer questions such as determining connectivity in the solar corona, measuring the nascent solar wind flow, and identifying and characterizing reconnection in the middle corona.



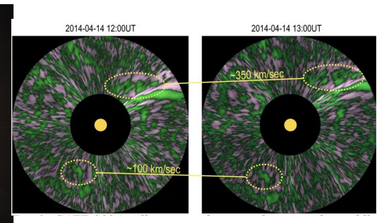


Photo above shows two different polarization angles - taken by australian team

Measuring the Nascent Solar Wind

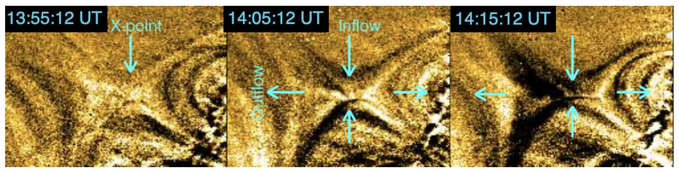
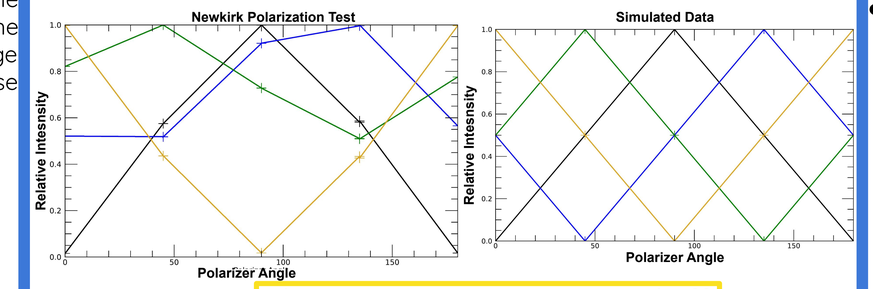


Photo above shows one of the possible theories correlated with coronal heating

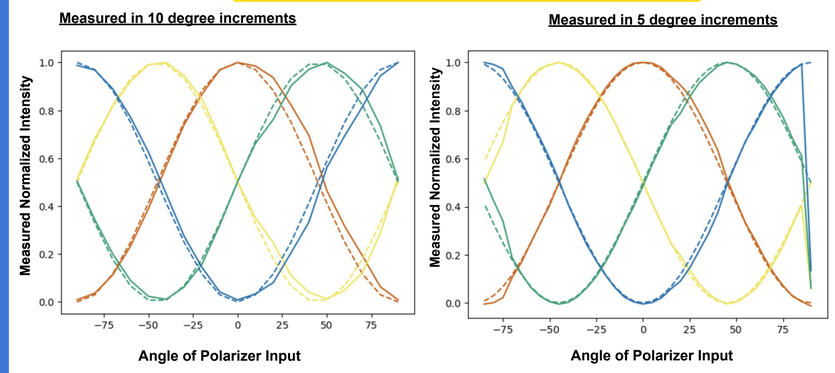
Camera Characterization

Camera characterization tasks included:

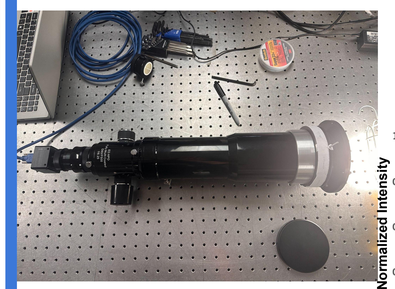
- characterizing 2 cameras: deciding which one has a better performance

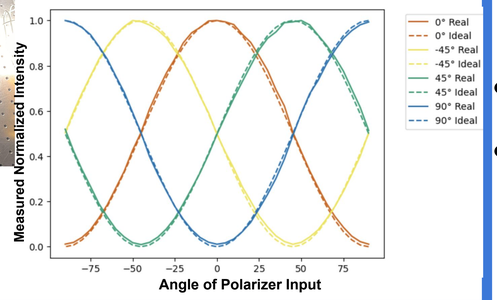


Characterizing camera 1- Pasachoff



Characterizing camera 2 - Menzel

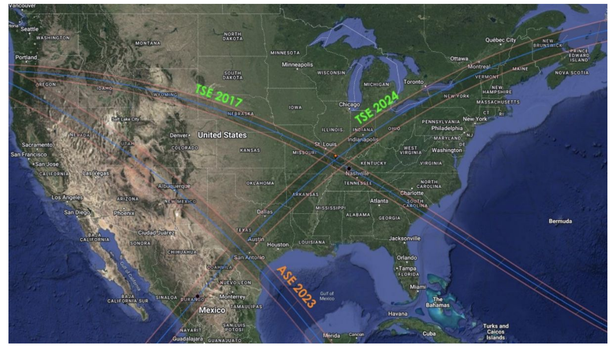




Outreach & Education

Outreach and education tasks included:

- mapping out communities around 2024 CATE team locations
- Focusing on:
  - **Native American reservations**
  - **Urban communities**
  - **libraries , observatories, planetariums, high schools, & colleges**



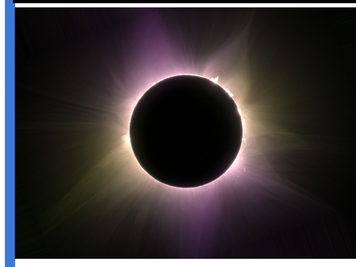
- CATE 2024 was designed so that anyone, regardless of age and skill level, could operate the telescope and camera equipment.
- Smaller communities get to keep the equipment they are given for their own educational benefit.
- We are attempting to spark a love for science and astronomy within the younger communities

Future Work

- Recruit regional/state coordinators and teams
- Purchase telescopes & other various equipment

Data Analysis

Camera or field? Pasachoff vs Menzel



References

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