REU FINAL PRESENTATION

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INTRODUCTION

Goal of the Summer: Observe the Sun using cameras designed for telescopes and image the Sun, both white light and Hydrogen Alpha filters. These views of the Sun will contribute to other solar research being done in the physics lab.

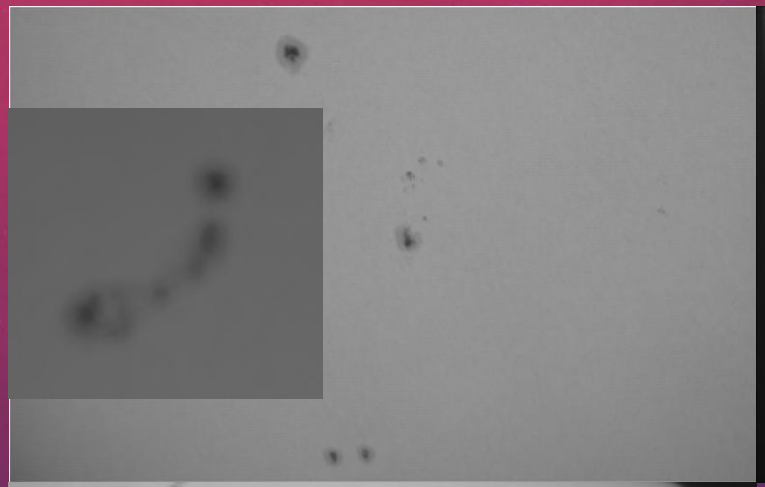
Requirements:

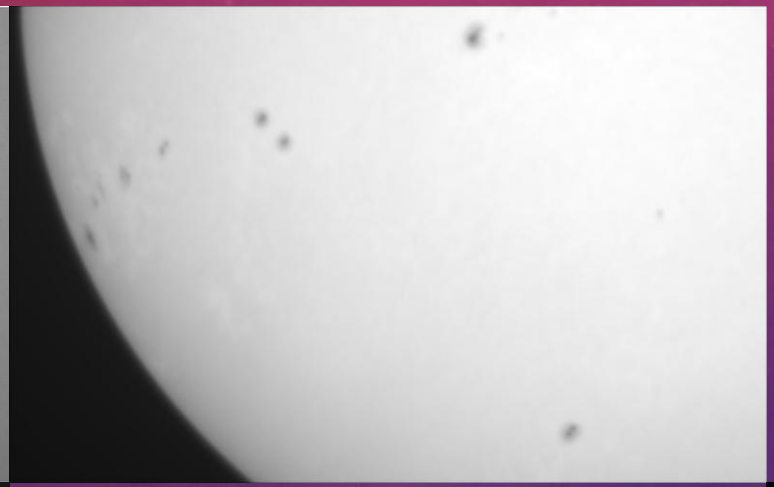
- Nighttime telescope with white-light filter (Meade telescopes)
- H-Alpha Telescope (Coronado)
- Software to drive the telescopes and feed them coordinates
- Cameras (color or monochrome)

EQUIPMENT

- Meade LX200GPS 8” (2000 mm)
- Meade LX200GPS 16” (4064 mm)
- Coronado Nearstar 6cm aperture
- Apollo IMX174 Mono Camera
- Artemis-C Pro IMX294 Color Camera
- ASCOM driver for both telescopes
- Stellarium for observing Sun’s position
- NINA for feeding telescopes coordinates
- SharpCap to use cameras
- RegiStax for photo stacking
- PixInsight (coming soon)

BEST PICTURES

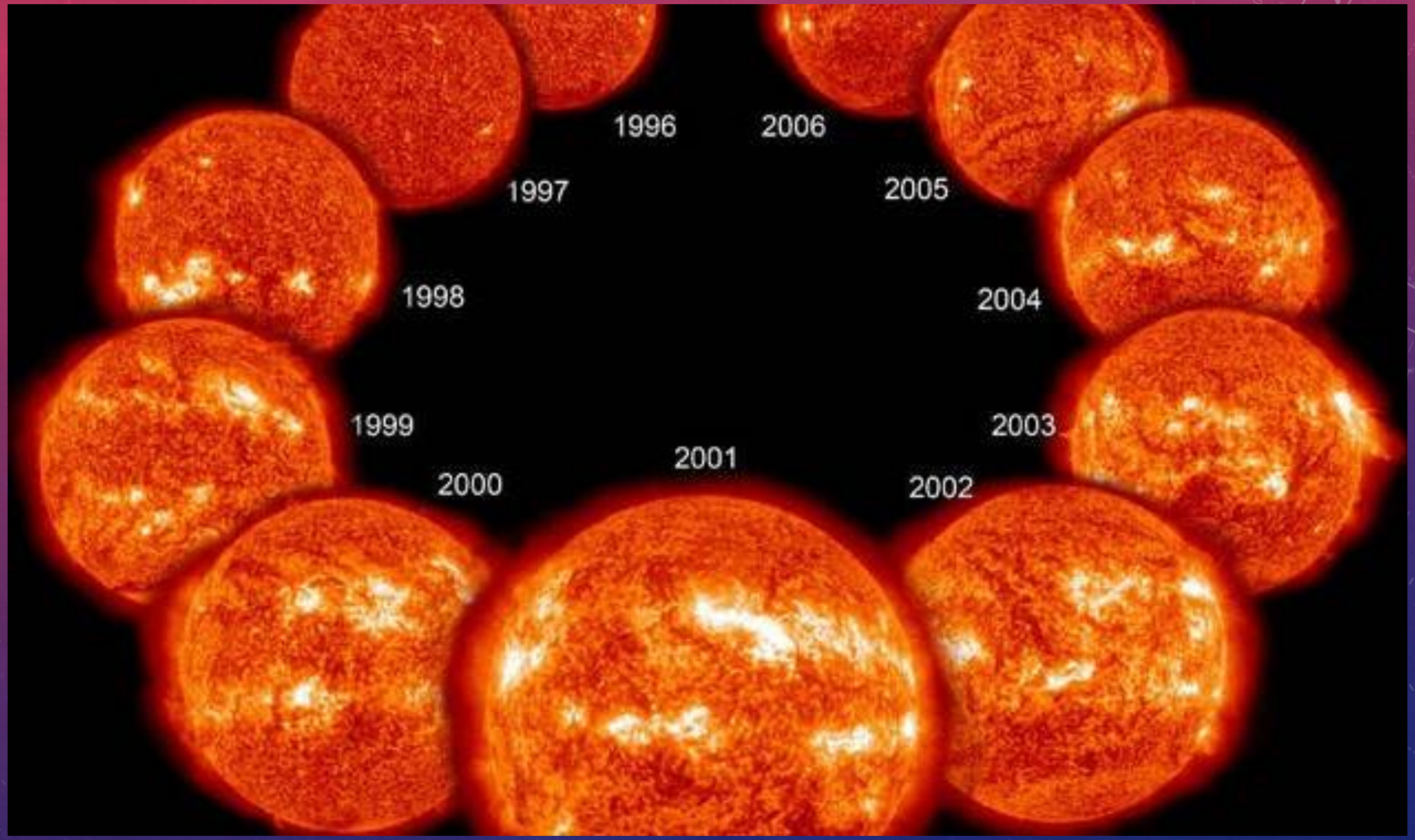




- 50 ms exposure time per frame
- 1000 frames stacked

White Light

- Note the increasing faculae with sunspots, more of each at solar maximum
- Faculae make the Sun about 0.1% brighter at solar maximum than at minimum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GOAL IMAGES

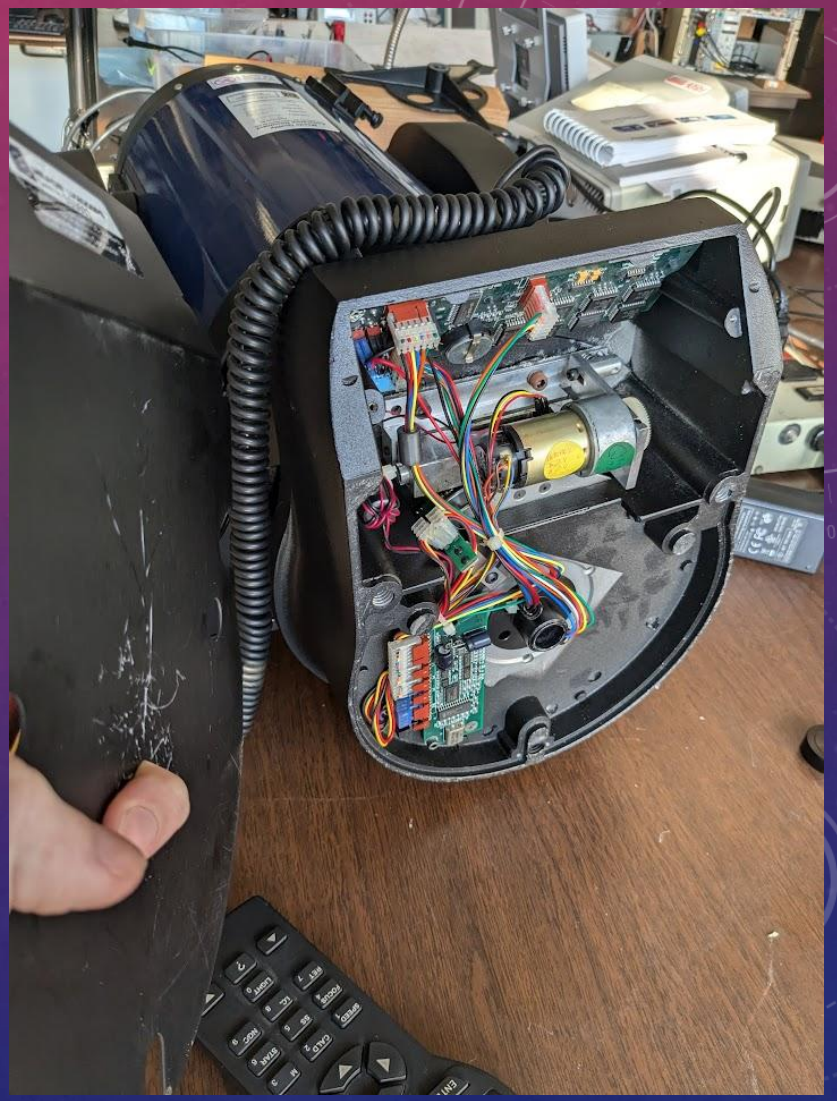
- H-Alpha photos taken by Prof. Jim Fakatselis
- 80mm aperture solar telescope
- Energy rejection filter, 0.5nm bandpass filter at 633 nm

WHAT WILL THESE IMAGES CONTRIBUTE?

- We are observing the amount of sunspots, solar flares and prominences seen on the Sun at a given time.
- Once the muon detector is up and running (Shorn's project), we will compare this data with muon detection data and find the pattern.

TROUBLES ENCOUNTERED

- Although the 16” telescope’s computer has run without much if any issues since its installment in June, the 8” which has been here longer had its share that all started with an old non-working GPS unit.
- The GPS unit on a telescope allows it to communicate with satellites to know where on Earth it is and what time, like your phone.



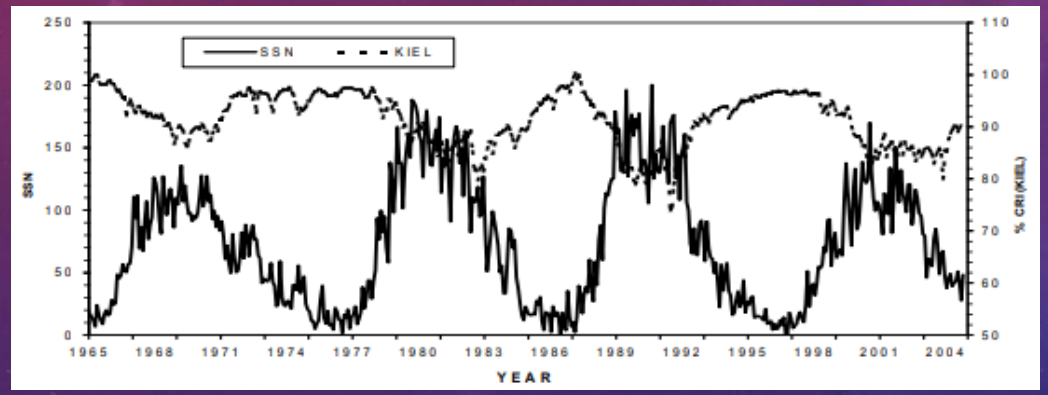
- After replacing the GPS unit, we thought there was a motherboard problem when there wasn’t, and ended up changing from upgrade 1.6 to 4.2l to 4.2g to 1.0y and back to 4.2l after resetting the entire telescope

Errors noticed:

- You should not leave the telescope slewing overnight, even if it does return to the Sun in the morning. The telescope’s azimuthal turn locks after a certain point.
- Telescope does not slew to exact coordinates commanded by NINA or Stellarium.

LITERATURE RESEARCH- COSMIC RAY MUONS

- Although the muons in this study are not from the Sun, the amount we see from space are based on the strength of the Sun's magnetic field at a given time.
- The mag. field of the Sun is at its peak during solar maximum as it is flipping which creates sunspots and other solar activities. Cosmic muon detection decreases during this time which ties into this project.
- Anti-correlation between cosmic rays (KIEL), muons and sunspot count (SSN)



- https://cds.cern.ch/record/957422/files/12147-ind-gupta-M-abs1-sh34-poster.pdf