



# 2026 Planet Hack Challenge – Day 1

Inspired by [Prof Helmut Jerjen](#), Research School of Astronomy and Astrophysics.

## The mission

The year is 2028. The International Space Exploration Coordination Group (ISECG) is preparing to launch a **\$100 billion deep-space satellite system** in 2035. Every electronic component on board is delicate. Every one of them is vulnerable to solar weather. In 2022, a single geomagnetic storm destroyed 38 Starlink satellites in a matter of hours and in 2026 Nasa had to launch an emergency mission to save the SWIFT space telescope (<https://www.bbc.com/news/articles/c0ry4xx7rk8o>). ISECG cannot afford a repeat at one hundred times the scale.

Your team has been called in as scientific advisors. You will analyse real solar data from the **SDO/HMI archive**, develop your own findings, and pitch your recommendation to the ISECG launch panel on video no longer than five minutes.

No written reports. No textbook answers. Show your evidence. Convince them.

## Supplementary Information

You need access to the SDO/HMI image archive: <https://jsoc1.stanford.edu/data/hmi/images/>

## Seniors Challenge: Predicting 2035

### Background

Unlike a solid planet, the Sun rotates at different speeds depending on latitude — a phenomenon known as differential rotation. This uneven motion twists magnetic field lines until they snap, producing solar flares and coronal mass ejections.

These events can induce powerful electrical currents in power grids and disrupt satellite electronics at Earth's distance. The 2035 launch window is fixed. ISECG needs to understand how active the Sun will be at launch, and how to respond if a major event occurs during deployment.

### Hack:

- Track at least two sunspots at significantly different solar latitudes using a time series of SDO/HMI images. Record their x and y pixel positions and Julian Date timestamps.
- Use trigonometric methods to determine the rotation period at each latitude. Plot x and y as functions of time, fit a sine curve, and estimate the rate of motion.
- Quantify differential rotation. Derive an equation describing rotation speed as a function of solar latitude, clearly stating any assumptions.

- Construct your own butterfly diagram across the two most recent solar cycles using sunspot latitude data over time. Use it to estimate the cycle period and identify when the next solar maximum is likely to occur.
- Forecast solar activity for the 2035 launch window. Cross-check your prediction against historical links between solar activity and radio blackout events on Earth (e.g. reported incidents).
- Recommend a mission protection strategy based on your forecast. This could include launch timing, orbital design, hardware shielding, or power grid management for supporting ground stations.
- Pitch your forecast and strategy to the ISECG launch panel on video. Show the maths. Show the butterfly diagram. Present the decision you would make if the final call were yours.