Solar System Reflectance Spectroscopy for Comparative Planetology with the Habitable Worlds Observatory

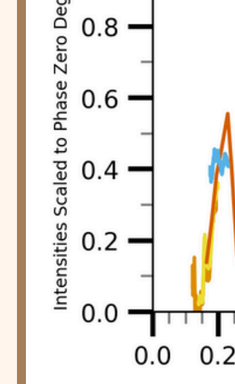
Allison Payne[1,2], Geronimo Villanueva[1], Vincent Kofman[1,3], Thomas Fauchez[1,3], Avi Mandell[1], Sara Faggi[1,3]

1. NASA Goddard Space Flight Center, 2. SURA, 3. American University

The search and characterization of habitable exoplanets can be greatly supported by studying reflected light from planets within our own solar system. Data collected from these nearby planets have higher signal-to-noise ratios (SNRs) and provide the most reliable spectral data. Light from the sun that is reflected off a planetary surface will pass through its atmosphere, and spectrometry reveals the unique absorption signatures that allow us to determine the chemical constituents of that atmosphere.

Now we should ask: ***How* can we use data available from solar system planets to better characterize potentially habitable planets?**

The answer: Combine spectral data from various ground- and space-based missions to create a more extensive baseline for the reflectance signatures of solar system planets. The **diversity of planets** in our solar system is key to developing this framework for **comparative planetology**. By comparing new exoplanet observations to known planetary spectra, we can begin to classify them based on similarities with the planets that we know best.

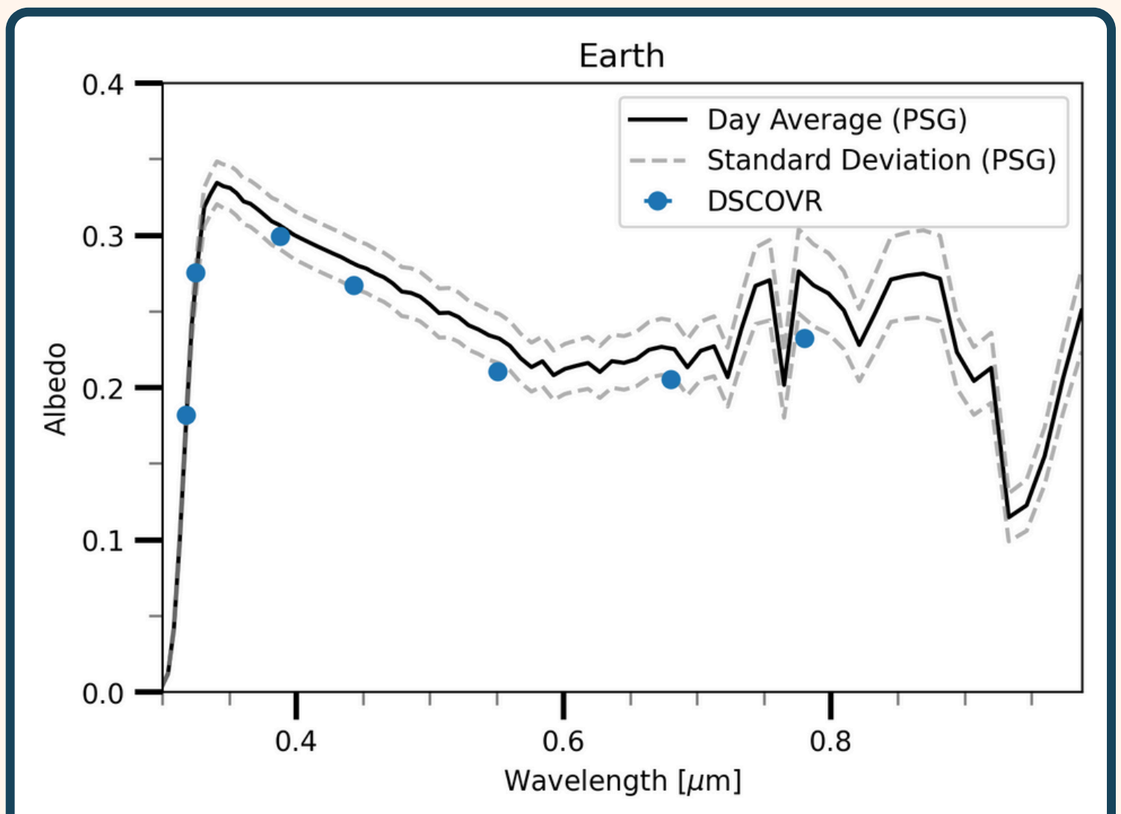


Case 2: Jupiter

Uninhabitable gas giant, thick Hydrogen (~90%) -Helium (~10%) atmosphere, lack of solid surface

Case 1: Earth

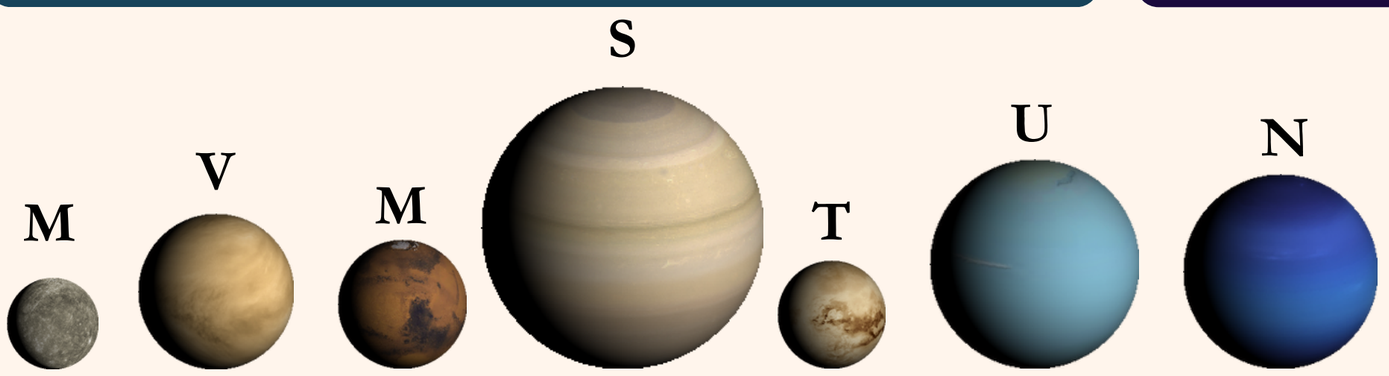
Habitable, rocky terrestrial planet, with oceans of liquid water, oxygen-rich atmosphere, moderate climate



Data provided by Dr. Vincent Kofman, produced using PSG, GlobES, and the Deep Space Climate Observatory (DSCOVR) climate data

Science Motivation

- Spectral library with **standardized units and planetary geometry will be essential for characterizing new exoplanet detections**
- HWO= first telescope designed specifically to search for signs of life on planets orbiting other stars
- **Search and characterize potentially habitable (Earth-like) planets**
  - close examination of atmospheres for possibility of life



Future Goals:

1. Develop a visual for the solar system seen through a future Habital Worlds Observatory coronagraph instrument
2. Compile results for each of the solar system planets and Titan to be submitted in my upcoming publication!