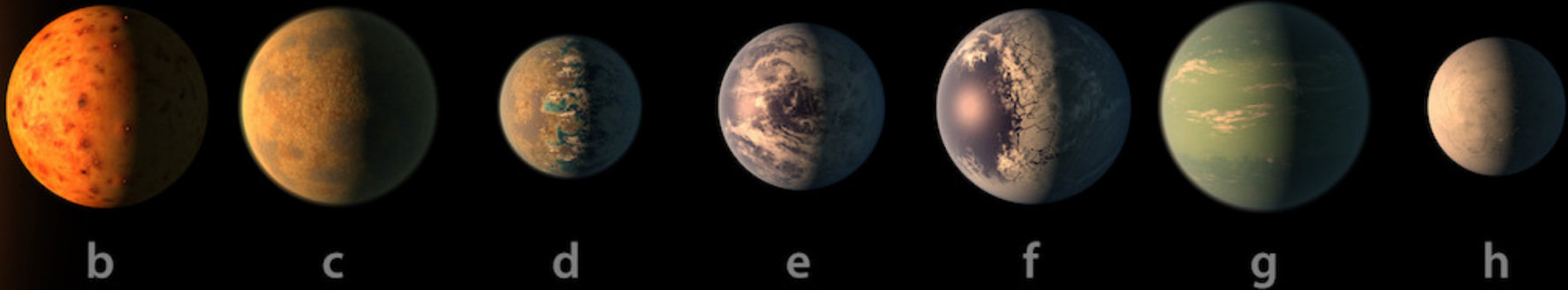


Adventures in the TRAPPIST-1 System: Moons and Atmospheres



SAN FRANCISCO
STATE UNIVERSITY

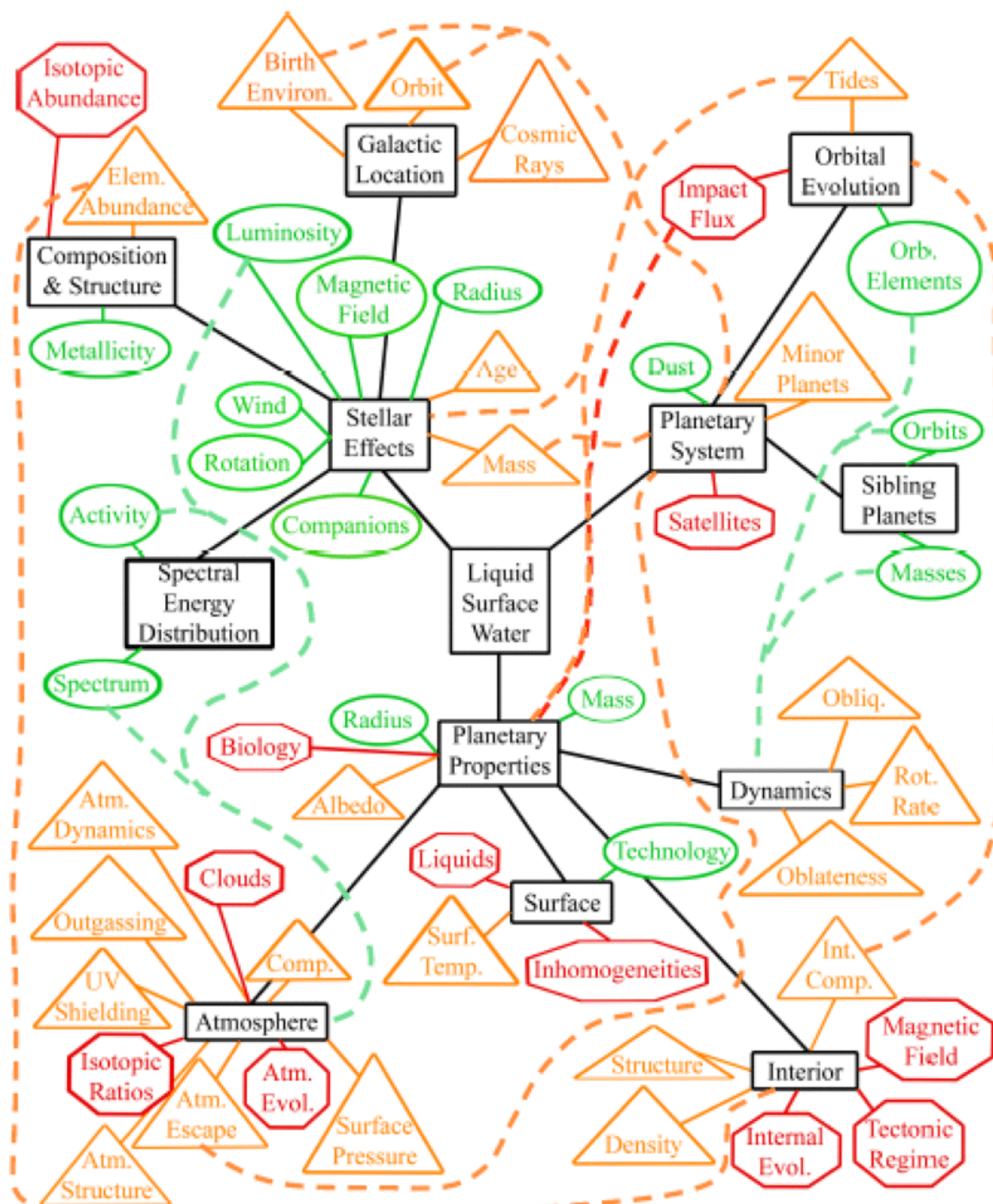
Stephen Kane



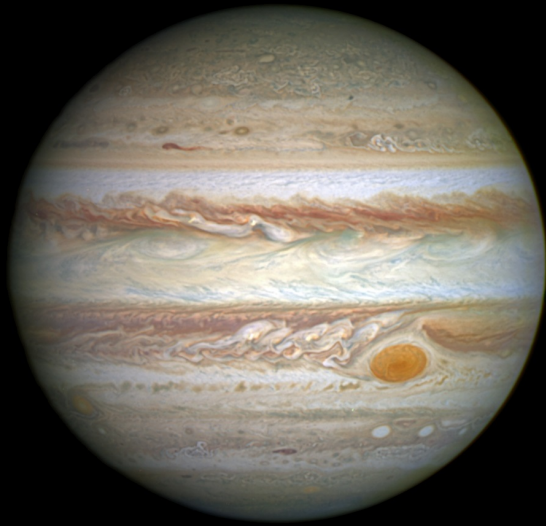


**I'M TIDALLY LOCKED AROUND AN
INTRINSICALLY FAINT STAR AND AM
REGULARLY PUMPED FULL OF XUV RADIATION**

**BUT I'M IN THE HABITABLE ZONE, SO
I GOT THAT GOIN FOR ME, WHICH IS NICE.**







Jupiter

Semi-major axis ~5 AU

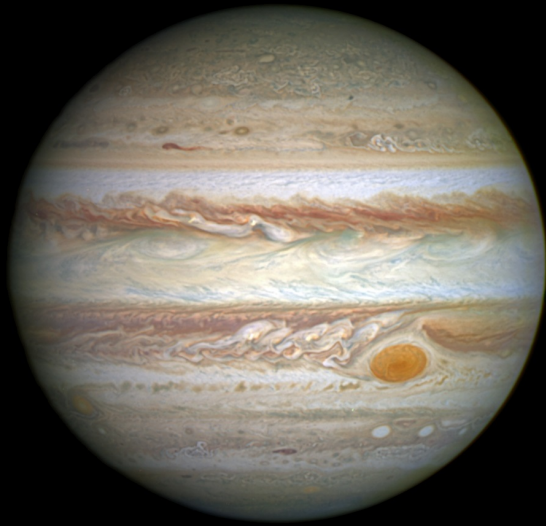
Hill radius ~ 50 million kms

Ganymede



~ 1 million kms





Jupiter

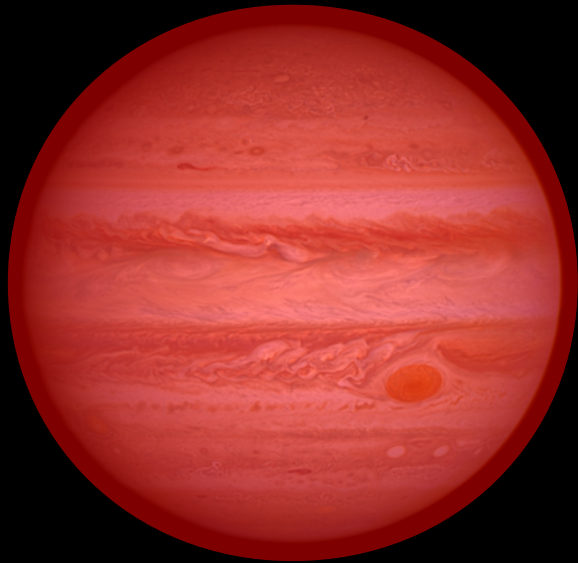
Semi-major axis ~ 5 AU

Hill radius ~ 50 million kms

Ganymede



~ 1 million kms



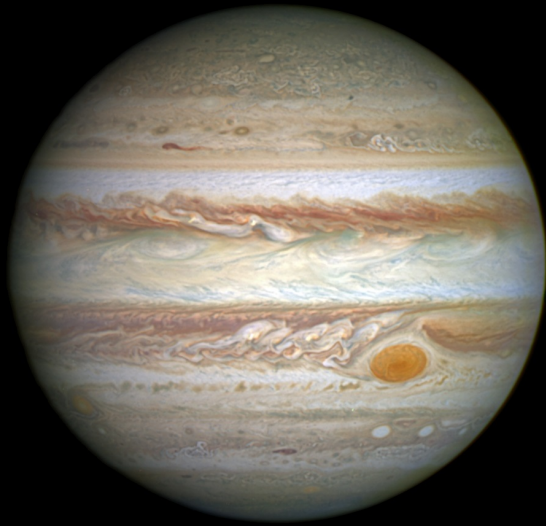
Hot Jupiter

Semi-major axis ~ 0.05 AU

Hill radius ~ 0.5 million kms

Not
Ganymede





Jupiter

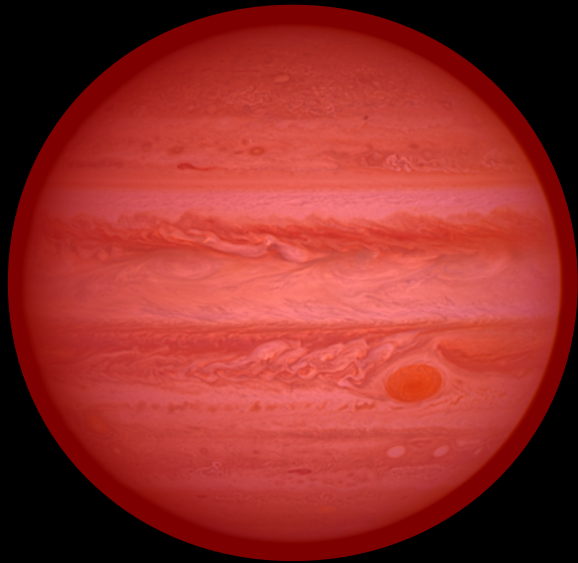
Semi-major axis ~ 5 AU

Hill radius ~ 50 million kms

Ganymede



~ 1 million kms



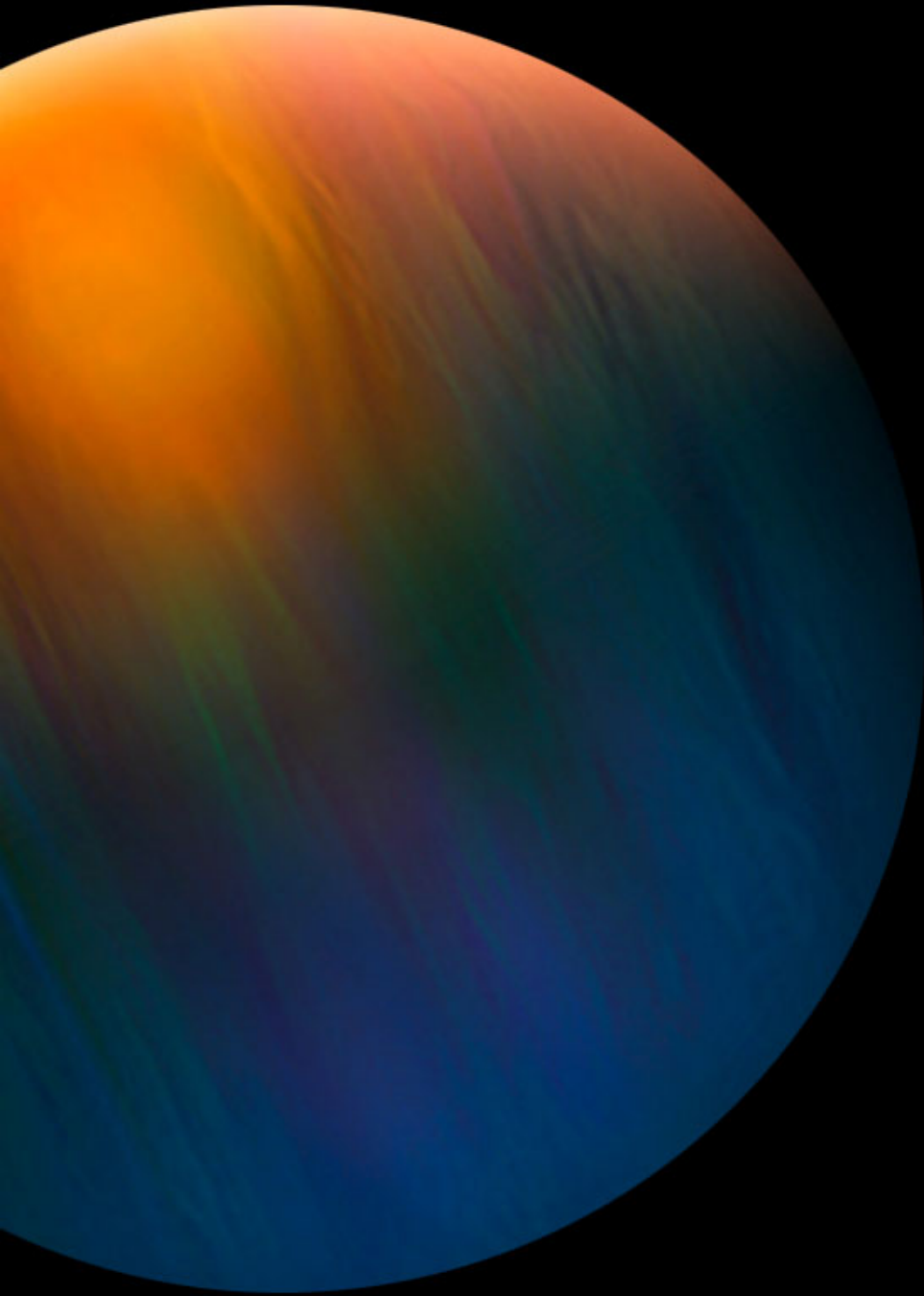
Hot Jupiter

Semi-major axis ~ 0.05 AU

Hill radius ~ 0.5 million kms

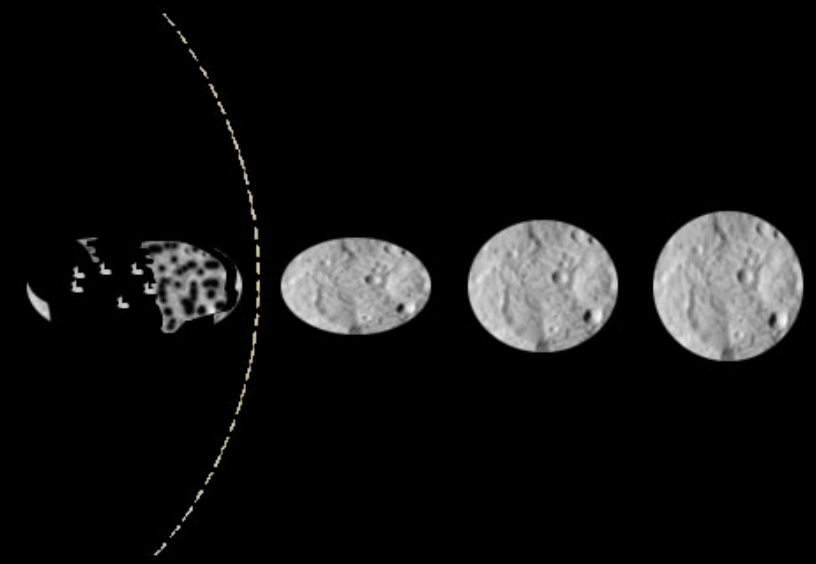
Not
Ganymede





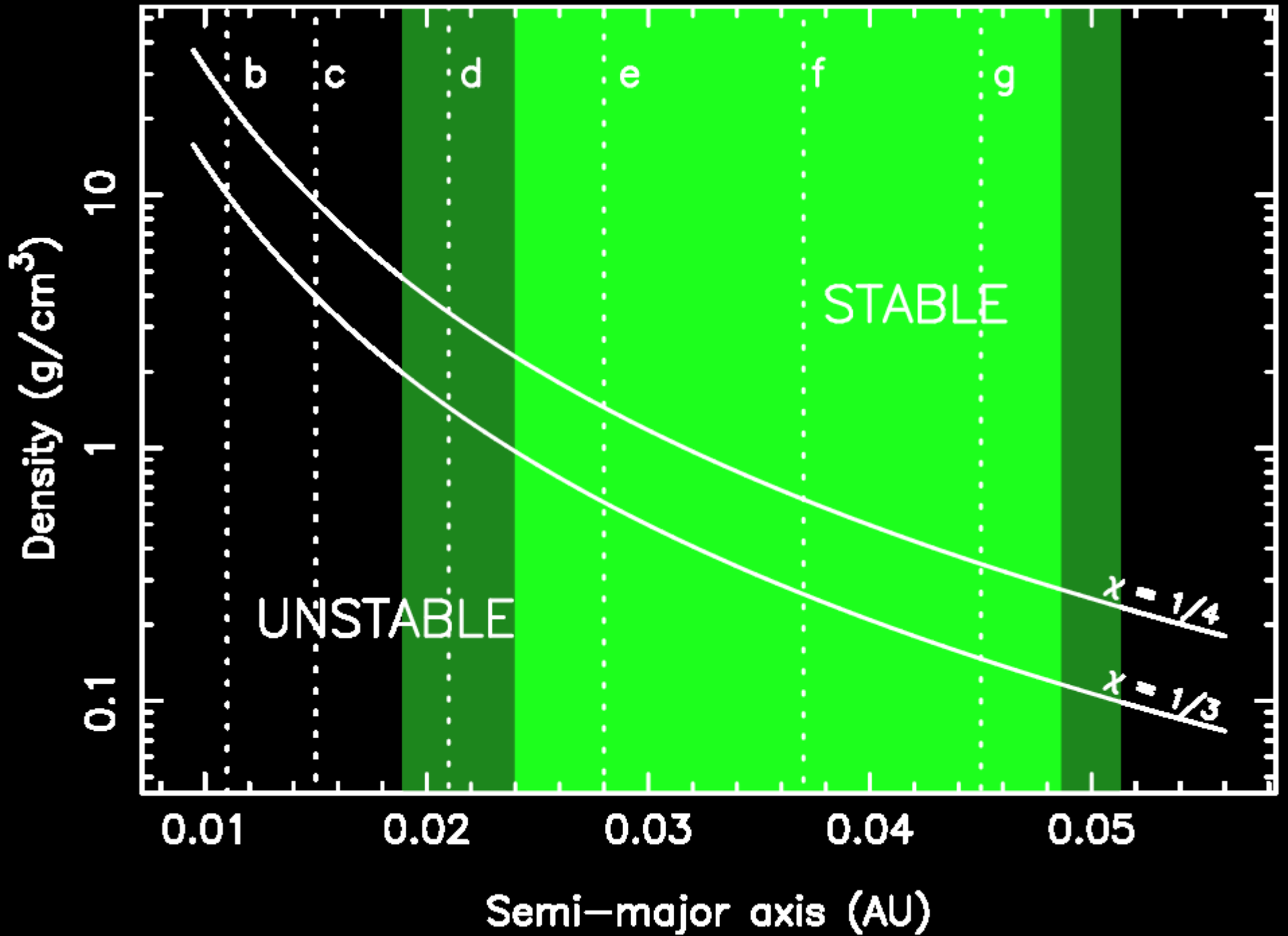
Roche limit

moon



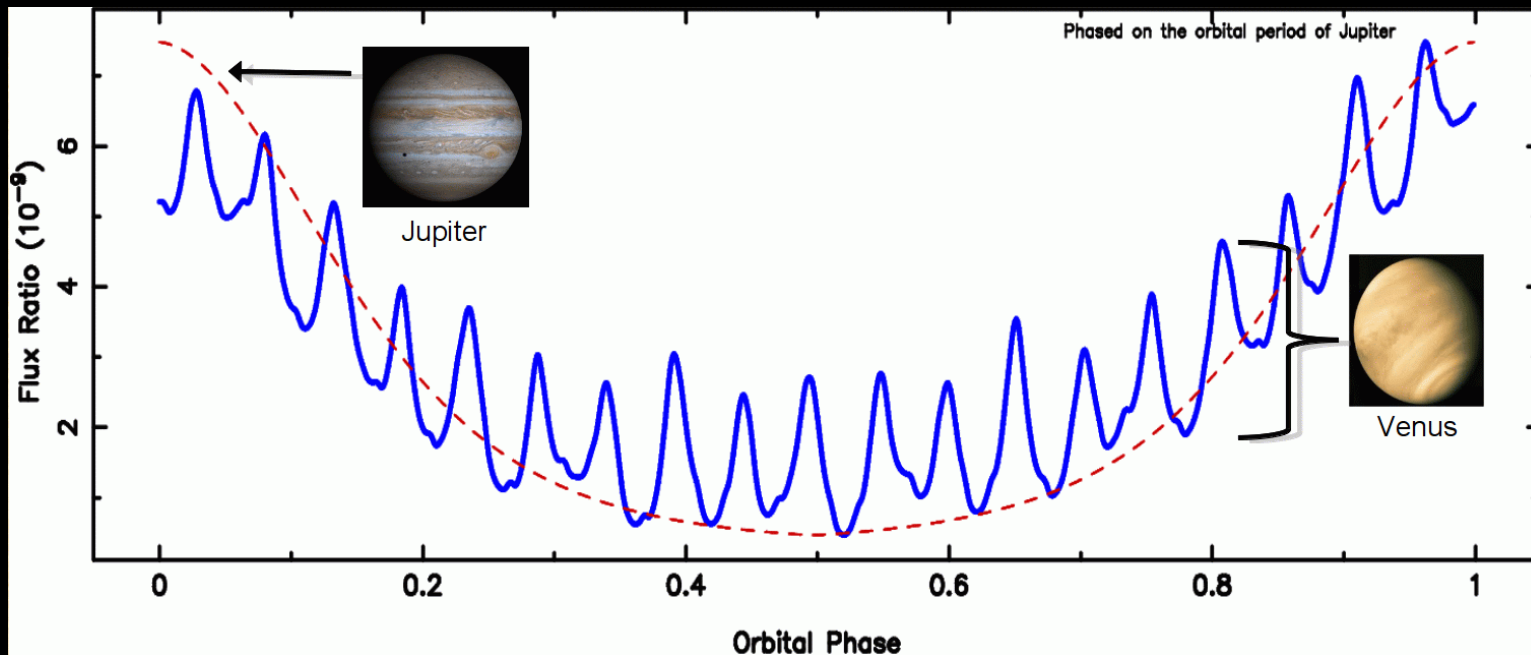
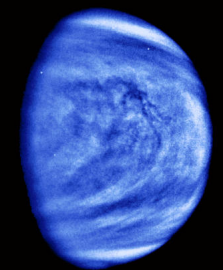
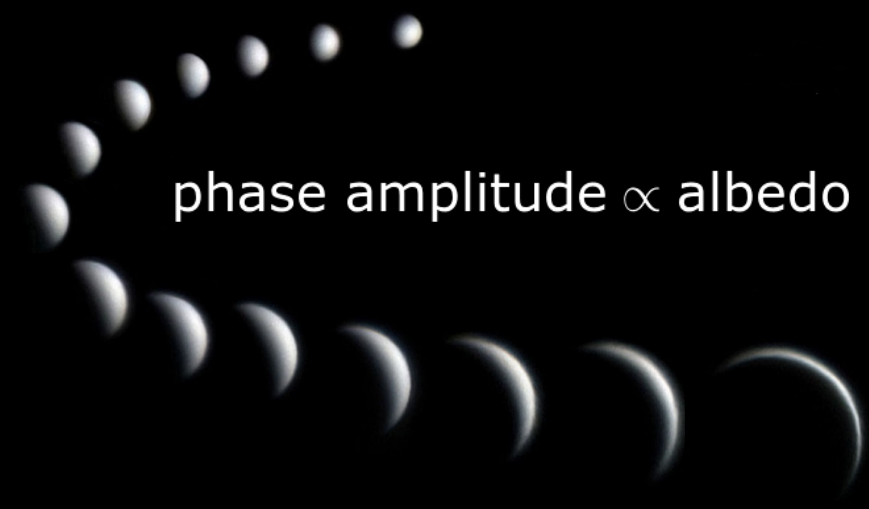
© Astronoo.com

Kane, 2017, ApJ, 839, L19

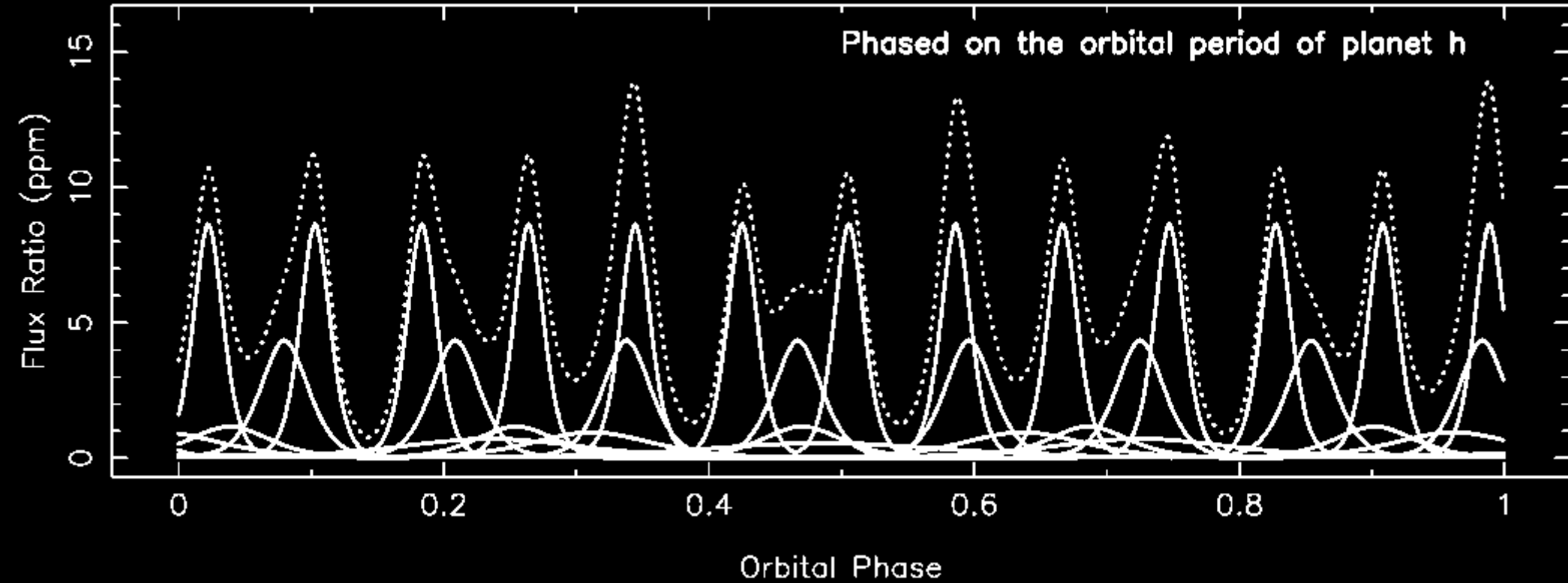


Studying Planetary Atmospheres

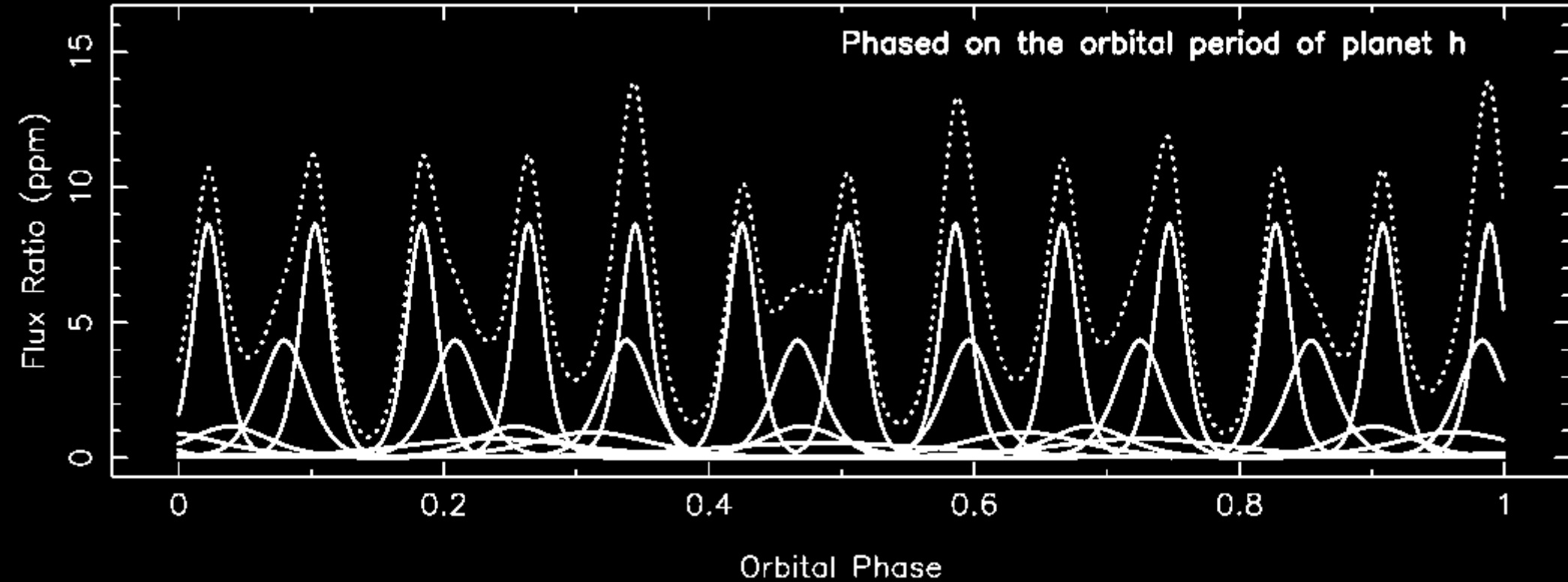
$$\text{phase amplitude} \propto \text{albedo} \times \left(\frac{\text{planet radius}}{\text{semimajor axis}} \right)^2$$



TRAPPIST-1

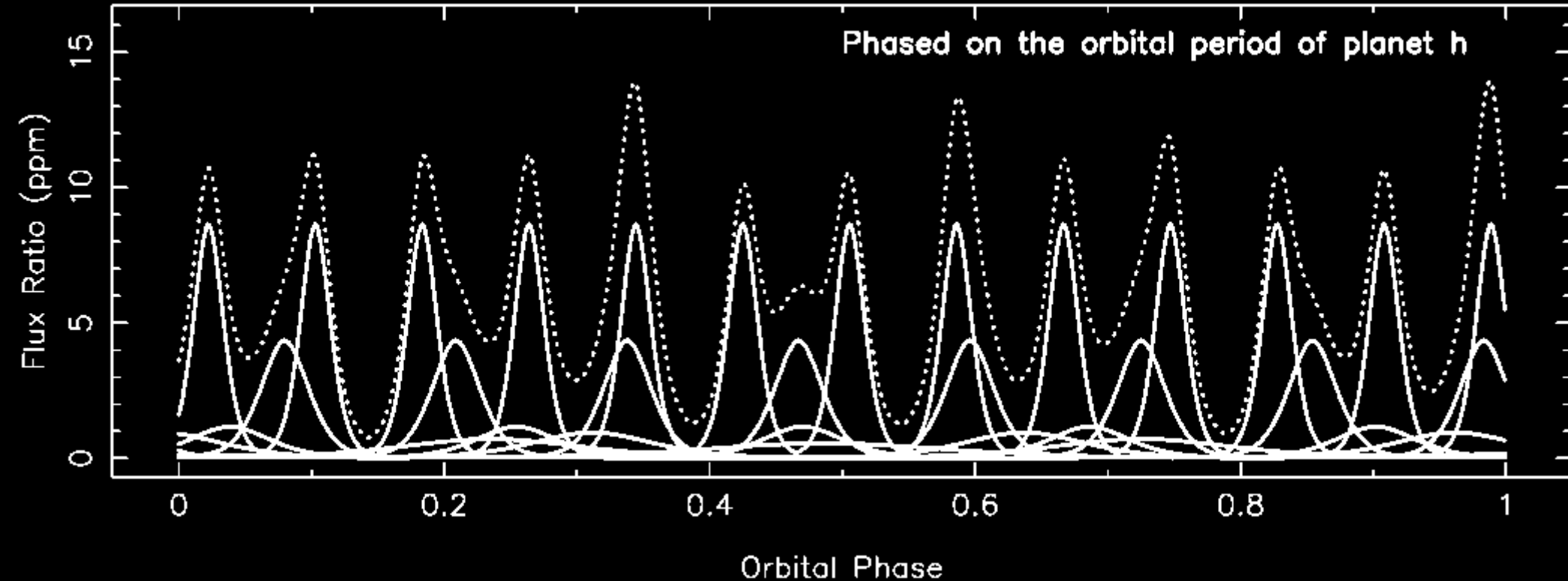


TRAPPIST-1



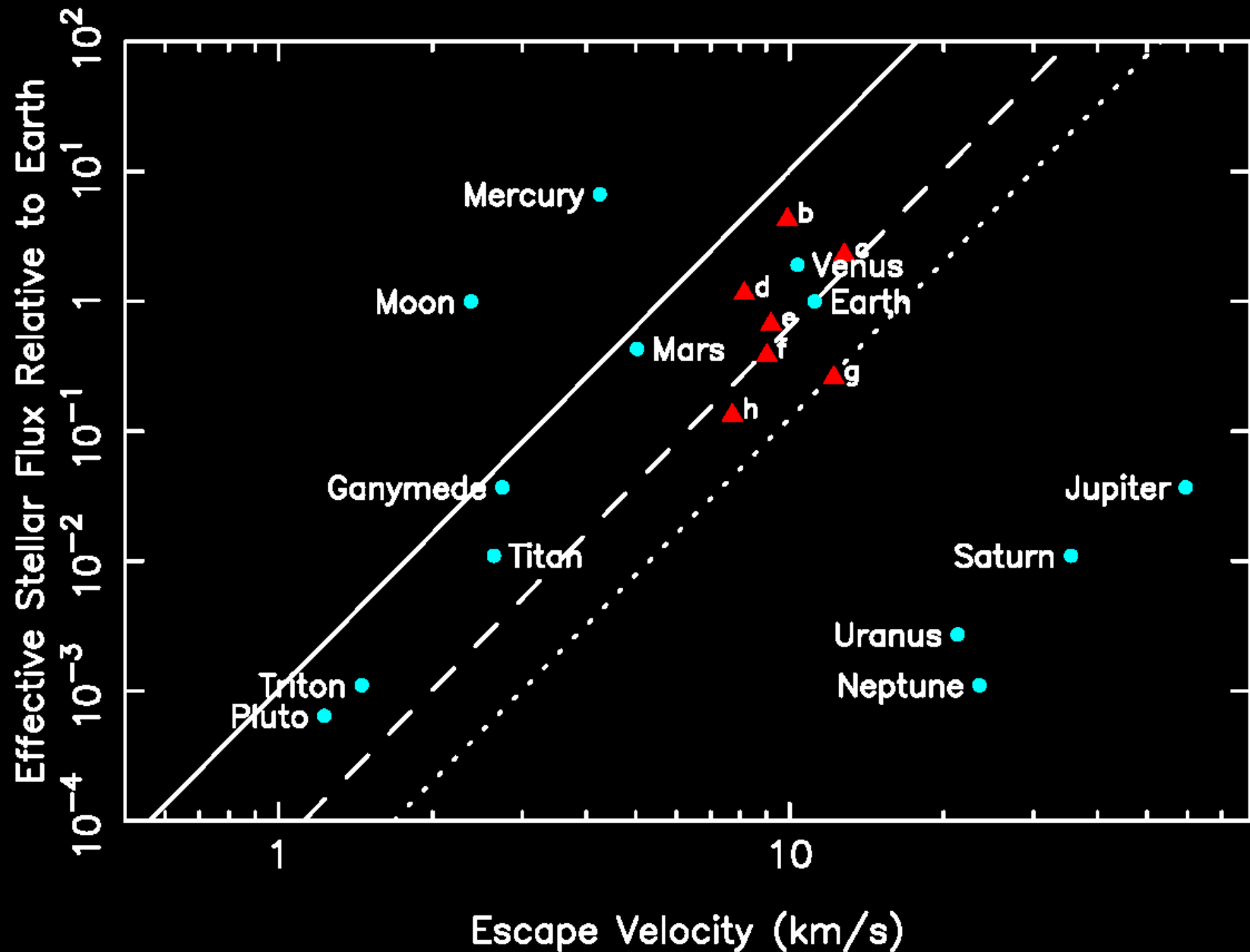
Surface conditions dependent

TRAPPIST-1



Surface conditions = rocky?
atmosphere?
molten?

The Cosmic Shoreline







Detection

- Transits
- Radial velocities
- Microlensing
- Imaging
- Observing strategies

Characterization

- Eccentricity
- Atmospheres
- Orbital stability
- Multiplicity
- Statistics

Habitability

- Habitable Zones
- Venus analogs
- Obliquity & eccentricity
- Atmospheric signatures
- Volcanic activity
- Target selection

**Graduate student
positions open!**

**Postdoctoral
positions open!**