Project 4 Presentation

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Abstract

Simulating the internal composition of exoplanets provides valuable insights in to the structure and formation of rocky planets. In this project, we utilize the ExoPlex software to model the interior structure of GJ-1132b, a known terrestrial exoplanet. By comparing its simulated composition to that of Earth, we assess differences in core, mantle, and crustal properties. Additionally, we place GJ-1132b's structure and composition in context by analyzing its predicted mineral properties alongside its orbital parameters, offering a comprehensive perspective on its internal composition.

Motivation

Why are we doing this

We are eager to learn new ways to learn about exo-planets and their interiors, therefor leading to an increase in “Earth-Like” Planets, here we focus on mineral composition and orbital paramters

Methodology

Warm up

To make sure we were knowledgeable enough about Exo-Plex some warm ups were given

Results

We calculated Earth's radius as roughly 0.999 Earth radii, given as its still a work in progress we took it

Methodology

- Use Exo-Plex to calculate a planet's density and structure
- Calculate planet structures from mass-proportions
- Place structure and composition in context of mineral and orbital parameters

Actual Project

The planet we chose was GJ 1132b, using Exo-Plex we define our variables and use the defined code to get some results, then comparing them to Earth

Assumptions

Mg/H=Fe/H
Si/H=Fe/H
Fe/Mg=0.9
Si/Mg=0.9
Ca/Mg=0.07
Al/Mg=0.09

Planetary values

Mass=1.66 M_earth
Radius=1.15 R_earth
A = 0.0153 AU
L = 0.00436 L_sun

Results

- The Code finds a Bulk-density for GJ 1132b of roughly 6.25 g/cm^3 (Earths is 5.514g/cm^3)
- The Model shows a near solar Fe/Mg ratio with most iron residing in the core
- Orbital: GJ 1132b is highly irradiated assuming little to no atmosphere
- Mineral: The planets mantle is different from Earths with a much richer supply of Mg and Si

Conclusion

Exo-Plex reveals GJ 1132b is a dense, rocky exoplanet with a substantial core, a concentration linked highly to its star, and an irradiated surface. Its composition various drastically from that of Earth.

This project demonstrated the effective use of Exo-Plex, and how much can be learned from exoplanets simply by studying their stars. This helps us as we leave this class onto future educational endeavors and our curiosity for the unknown grows larger

Fin

Thank you for a great semester!