Exoplanets

An exoplanet is any planet beyond our solar system. Most of them orbit other stars, but some free-floating exoplanets, called rogue planets, are untethered to any star. We've confirmed more than 5,600 exoplanets out of the billions that we believe exist.

Types of Exoplanets

Each planet type varies in interior and exterior appearance depending on composition.

Gas Giants

Massive planets similar in size to Jupiter or Saturn, or even larger. Includes varieties like "Hot Jupiters," which are gas giants orbiting close to their stars, leading to extremely high temperatures.

Neptunian Planets

Planets similar in size to Neptune or Uranus, with hydrogen and helium-dominated atmospheres and rocky cores. Includes "mini-Neptunes," which are smaller than Neptune but larger than Earth.

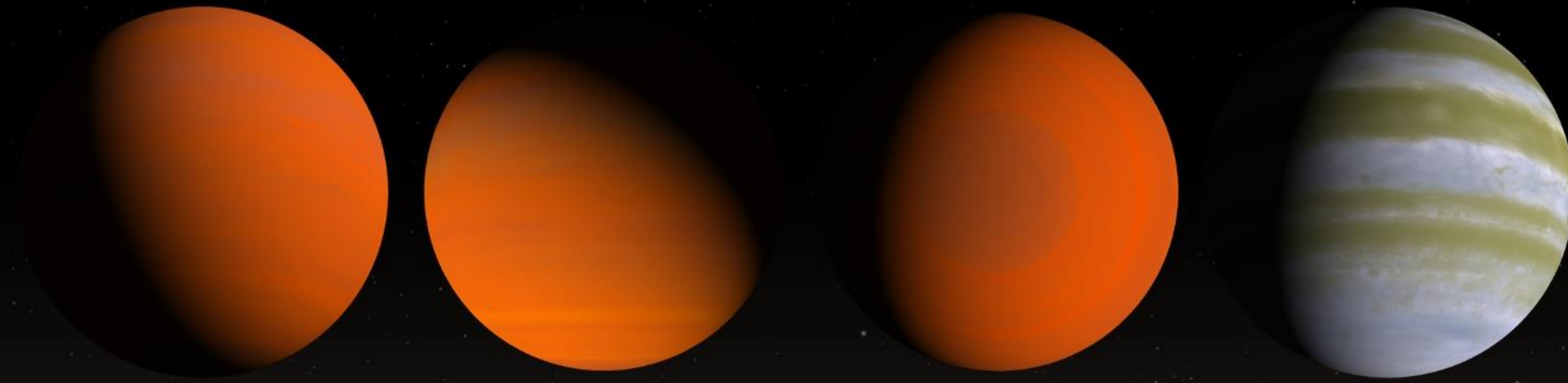
Super Earths

Terrestrial planets larger than Earth but lighter than Neptune. They may or may not have atmospheres.

Terrestrial Planets

Earth-sized or smaller planets composed of rock, silicate, water, or carbon. Further exploration is needed to determine if they have atmospheres or oceans, or could be habitable.

Gas Giants



51 Pegasi b

KELT-9 b

WASP-96 b

PH1 b

51 Pegasi b

Planet Details:

Orbital Period: 4.2 days

Distance from Star: 0.05 AU

Atmosphere Gases: Hydrogen and helium-rich with possible water vapor.

Temperature Range : 1200°C - 1500°C

Mass: 158.9 Earth

Surface Conditions: No solid surface only Gaseous atmosphere

Test Info:

Best Wavelength for Atmospheric Analysis: 20 μm

Best Probe for Temperature Measurement: High-Temperature Probe

The first exoplanet discovered around a Sun-like star, 51 Pegasi b is often referred to as a "hot Jupiter" due to its close orbit and gas giant status

KELT-9 b

Planet Details:

Orbital Period: 1.5 days

Distance from Star: 0.03 AU

Atmosphere Gases: Composed mainly of hydrogen and Helium with metal atoms due to intense heat.

Temperature Range : 4300°C - 4600°C

Mass: 890.0 Earth

Surface Conditions: Extremely hot gaseous atmosphere; temperatures can reach over 4000°C With No solid surface.

Test Info:

Best Wavelength for Atmospheric Analysis: 5μm

Best Probe for Temperature Measurement: High-Temperature Probe

Known for being one of the hottest exoplanets discovered, KELT-9 b's atmosphere is so hot that even molecules cannot survive intact

WASP-96 b

Planet Details:

Orbital Period: 3.4 day

Distance from Star: 0.04 AU

Atmosphere Gases: Composed mainly of hydrogen, Helium and Sodium with potential of presence of Water vapor.

Temperature Range : 1200°C - 1500°C

Mass: 158.9 Earth

Surface Conditions: Gaseous atmosphere with no solid surface

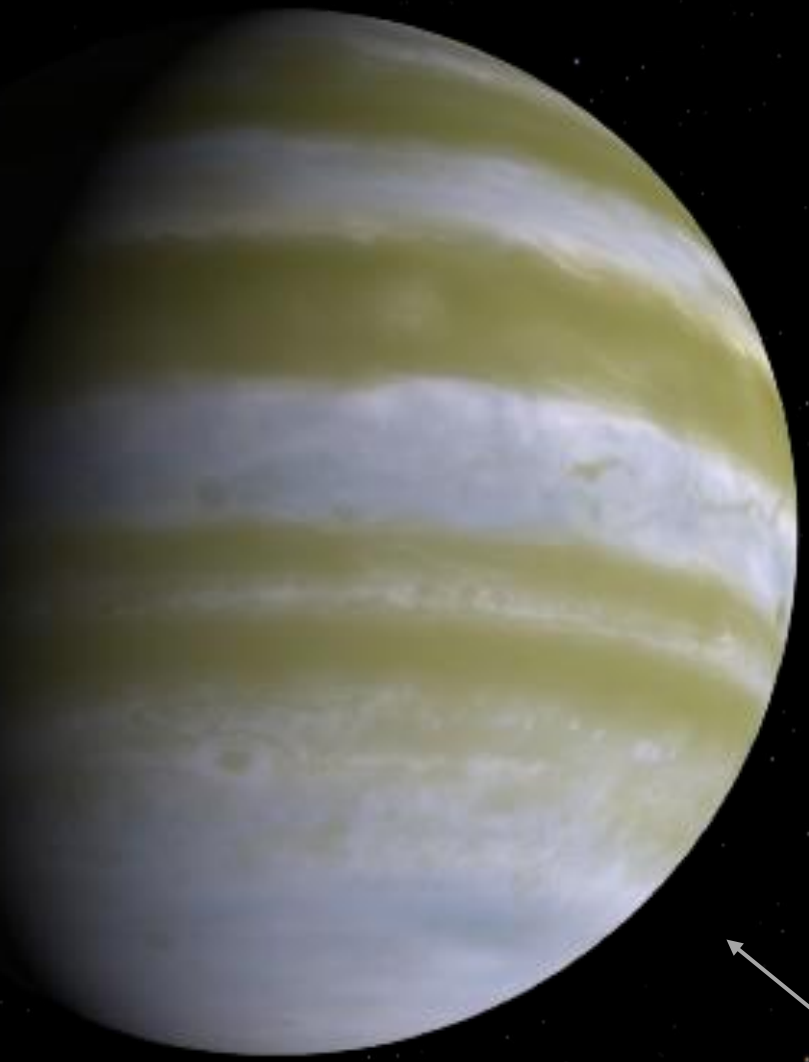
Test Info:

Best Wavelength for Atmospheric Analysis: 15μm

Best Probe for Temperature Measurement: High-Temperature Probe

WASP-96 b has a cloud-free atmosphere, which allows for clear detection of sodium in its

PH1 b



Planet Details:

Orbital Period: 138 day

Distance from Star: 0.64 AU

Atmosphere: Hydrogen-rich with Helium and Water Vapor.

Temperature Range : -100°C to 700°C

Mass: 158.9 Earth

Surface Conditions: No solid surface, only gases.

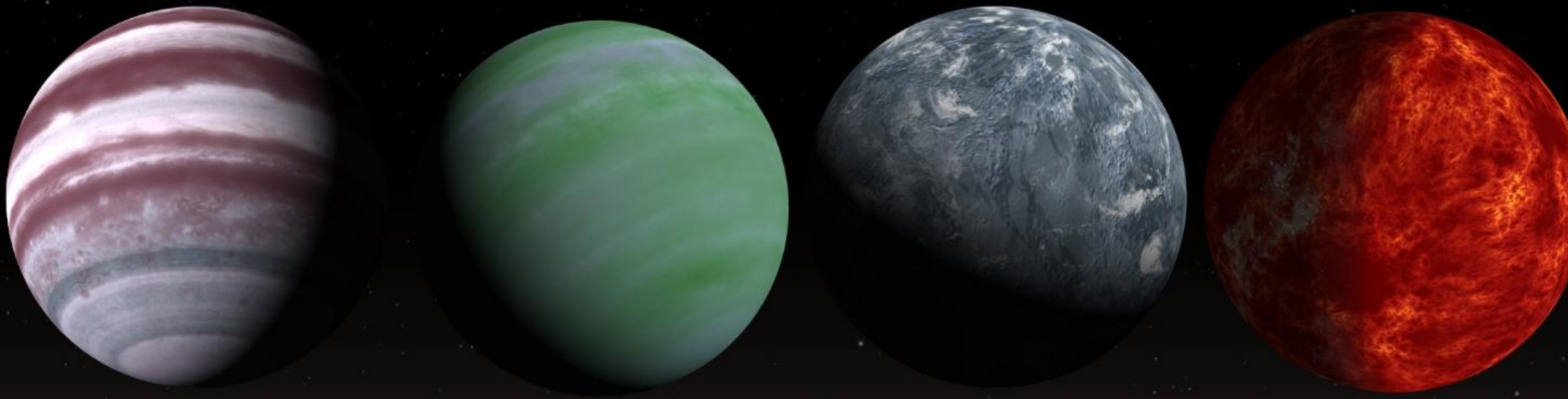
Test Info:

Best Wavelength for Atmospheric Analysis: 20μm

Best Probe for Temperature Measurement: Standard Probe

- PH1 b orbits in a rare four-star system, making it one of the most unusual exoplanets in terms of its stellar environment.

Neptunian Planets



GJ 1214 b

HD 176986 b

HAT-P-11 b

55 Cancri e

55 Cancri e

Planet Details:

Orbital Period: 0.74 day

Distance from Star: 0.015 AU

Atmosphere Gases: Possible carbon Dioxide-rich with Hydrogen, Helium and Water Vapor.

Temperature Range : 1700°C - 2400°C

Mass: 8 Earth

Surface Conditions: Likely a rocky core with a thick atmosphere, potential for high-pressure carbon or molten surface, Potential lava oceans..

Expected Surface Minerals: Graphite, diamond (due to high carbon content), and silicates.

Test Info:

Best Wavelength for Atmospheric Analysis: 20μm

Best Probe for Temperature Measurement: High-Temperature Probe

- This Neptunian planet has an extremely short orbital period of just 18 hours, and it may have lava flows on its day side.

GJ1214 b

Planet Details:

Orbital Period: 1.58 day

Distance from Star: 0.014 AU

Atmosphere Gases: Thick atmosphere likely composed of water vapor, Hydrogen and Helium.

Temperature Range : 120°C - 300°C

Mass: Estimated to be around 11 Jupiter masses

Surface Conditions: Possibly an ocean world with a thick atmosphere, may have a water-rich composition.

Expected Surface Minerals: Likely water-rich compounds like hydrates and silicates.

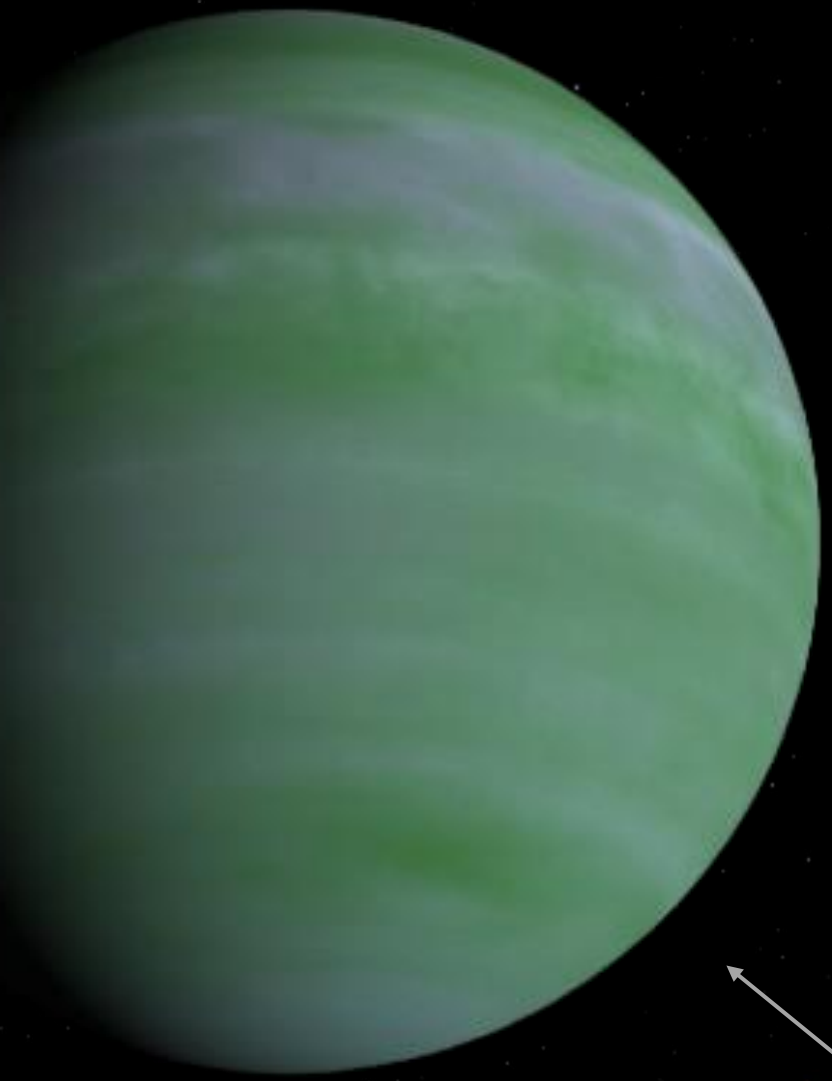
Test Info:

Best Wavelength for Atmospheric Analysis: 20μm

Best Probe for Temperature Measurement: Standard Probe

- Often referred to as a "water world," GJ 1214 b may have a thick atmosphere dominated by water vapor.

HD 176986 b



Planet Details:

Orbital Period: 432.5 Days

Distance from Star: 1.25 AU

Atmosphere Gases: Likely hydrogen, helium and Methane with potential dust clouds

Temperature Range : -120°C - 80°C

Mass: 318 Earth

Surface Conditions: it likely has a core composed of heavier elements and surrounded by gases, Possibly an ice world.

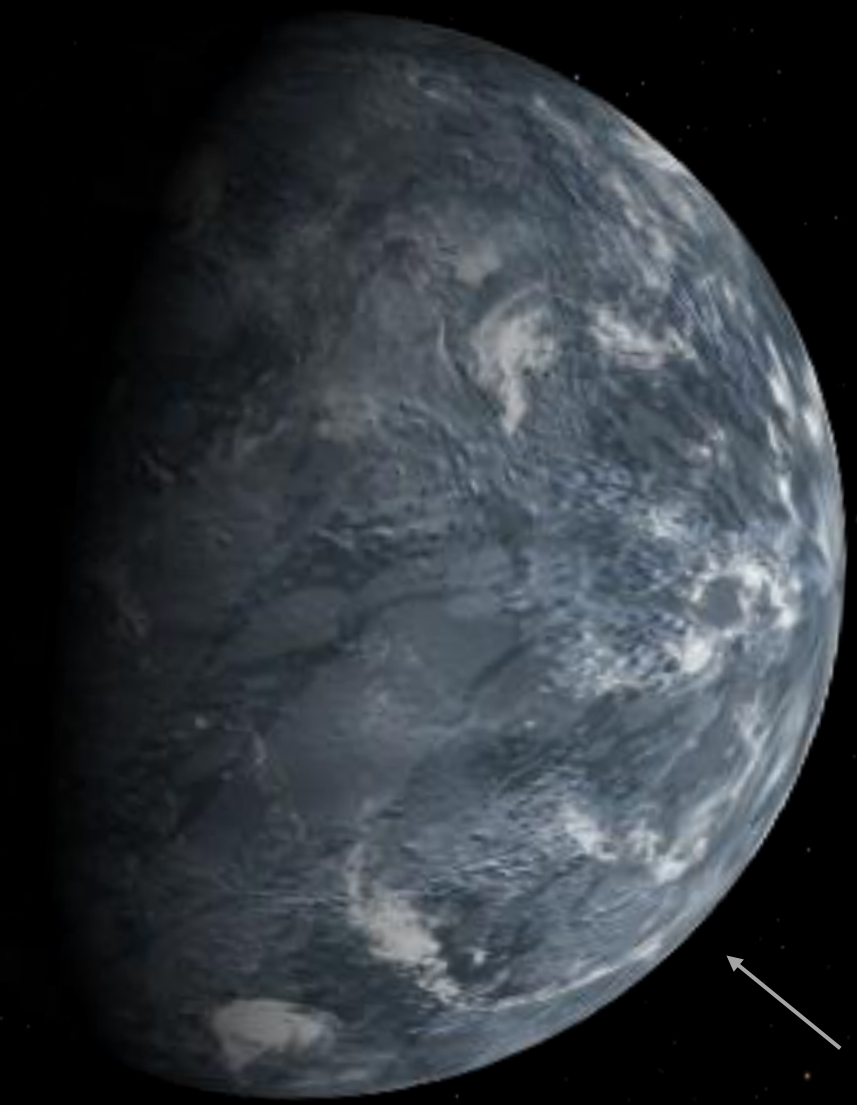
Test Info:

Best Wavelength for Atmospheric Analysis: 15μm

Best Probe for Temperature Measurement: Standard Probe

HD 176986 b is a massive exoplanet with an incredibly distant orbit around its star, raising questions about planet formation theories.

HAT-P-11 b



Planet Details:

Orbital Period: 4.89 days

Distance from Star: 0.053 AU

Atmosphere: Clear atmosphere with water vapor detected.

Temperature Range : -110°C to 600°C

Mass: 3495.8 Earth

Surface Conditions: his surface made of thick layer of ice and liquid water beneath a dense atmosphere.

Test Info:

Best Wavelength for Atmospheric Analysis: 10μm

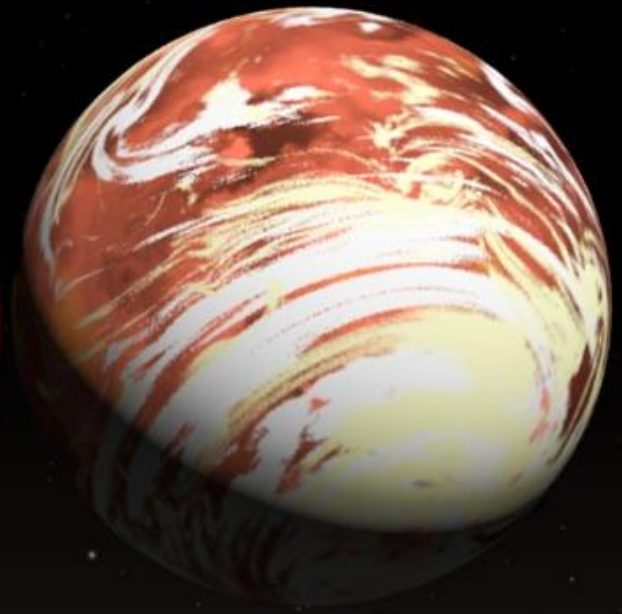
Best Probe for Temperature Measurement: High-Temperature Probe

- HAT-P-11 b is one of the smallest exoplanets with a clear detection of water vapor in its atmosphere.

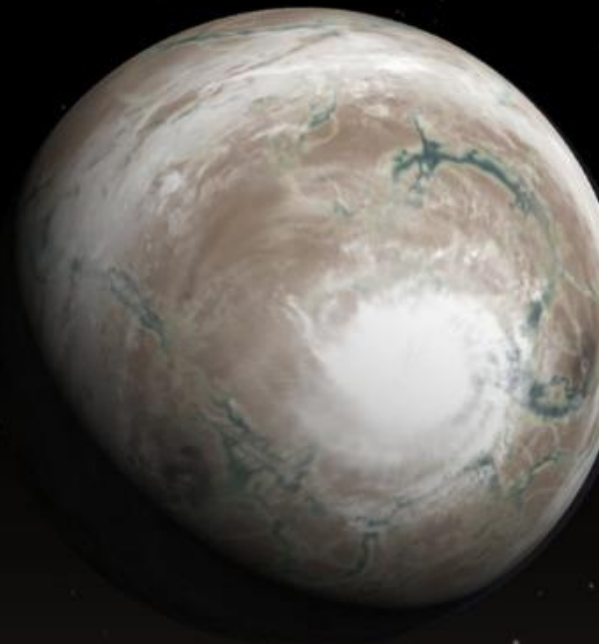
Super Earths

Gliese 581g

CoRoT-7 b

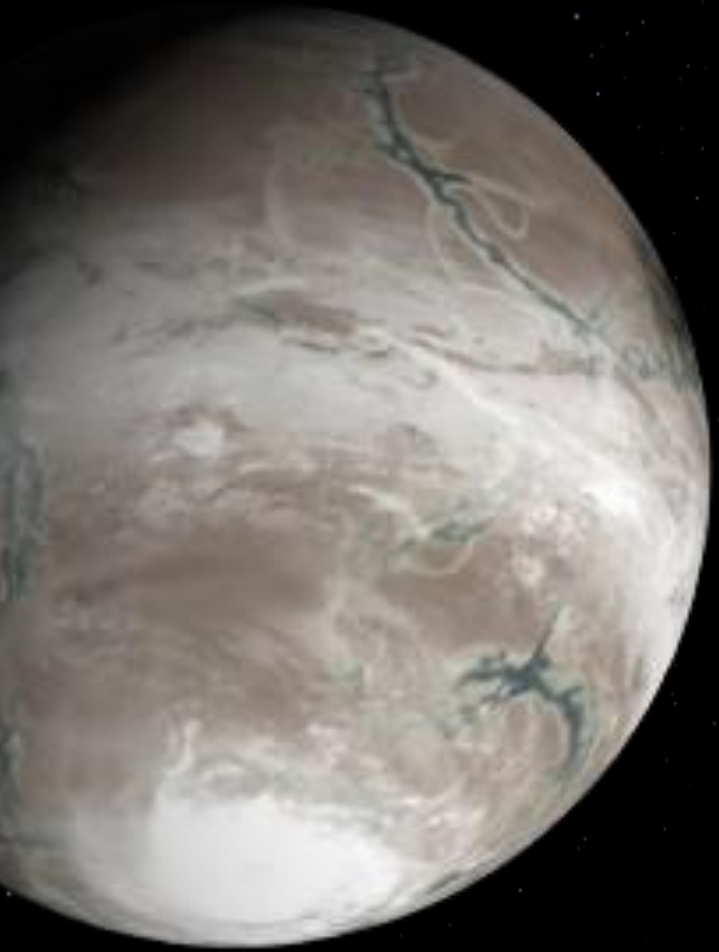


LHS 1140 b



Kepler-452 b

Kepler-452 b



Planet Details:

Orbital Period: 385 days

Distance from Star: 1.05 AU

Atmosphere Gases: Likely Nitrogen, Oxygen and Water Vapor

Temperature Range : -30°C to 90°C

Mass: 5 Earth

Surface Conditions: Potentially Earth-like with unknown composition with Rocky Surface.

Expected Surface Minerals: Silicates, carbonates, possibly water (liquid or ice), and iron-rich minerals

Test Info:

Best Wavelength for Atmospheric Analysis: 20μm

Best Probe for Temperature Measurement: Standard Probe

- Kepler-452 b is located in the habitable zone of a Sun-like star, and it has been dubbed Earth’s "cousin" due to its Earth-like properties.

LHS 1140 b

Planet Details:

Orbital Period: 24.7 days

Distance from Star: 0.09 AU

Atmosphere Gases: Thick atmosphere with Hydrogen, Sodium and Water vapor.

Temperature Range : -70°C to 30°C

Mass: 6.6 Earth

Surface Conditions: Likely rocky surface with potential for an atmosphere possibly habitable.

Expected Surface Minerals: Silicates, iron oxides, and potentially water ice or liquid water.

Test Info:

Best Wavelength for Atmospheric Analysis: 20μm

Best Probe for Temperature Measurement: Standard Probe

- A dense and rocky world, LHS 1140 b is situated in the habitable zone of a red dwarf star, with a thick atmosphere potentially capable of supporting life.

CoRoT-7 b

Planet Details:

Orbital Period: 0.85 days

Distance from Star: 0.017 AU

Atmosphere Gases: Possible thin atmosphere constantly evaporating due to extreme heat with Hydrogen, carbon Dioxide and water vapor.

Temperature Range : 1500°C - 2300°C

Mass: 4.8 Earth

Surface Conditions: Rocky Surface with extreme temperatures, possible volcanic activity.

Expected Surface Minerals: Basalt, silicates, and possibly molten lava.

Test Info:

Best Wavelength for Atmospheric Analysis: 15μm

Best Probe for Temperature Measurement: High-Temperature Probe

- CoRoT-7 b is known for its extremely short orbital period and a surface that might be covered in lava oceans due to its proximity to its star.

Gliese 581g

Planet Details:

Orbital Period: 37 days

Distance from Star: 0.15 AU

Atmosphere Gases: Potentially presence of Nitrogen, Oxygen and Water vapor.

Temperature Range : -37°C to 20°C

Mass: 3.1 Earth

Surface Conditions: rocky surface, Potentially Earth-like may support liquid water depending on atmosphere.

Expected Surface Minerals: Silicates, carbonates, and possibly water ice.

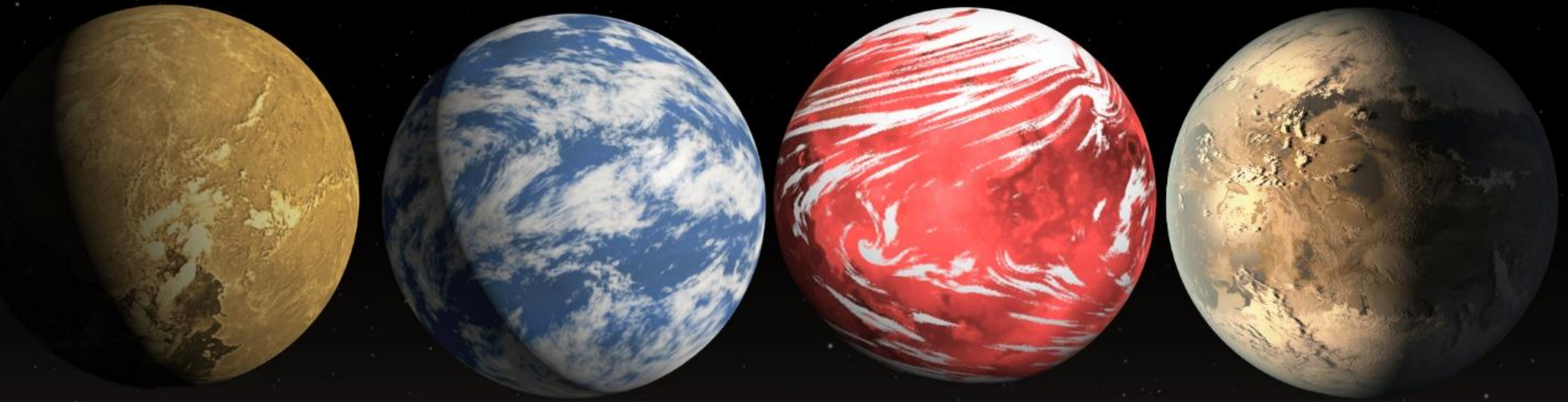
Test Info:

Best Wavelength for Atmospheric Analysis: 20μm

Best Probe for Temperature Measurement: Standard Probe

- Gliese 581g is located in the habitable zone of its star, making it one of the most promising candidates for finding extraterrestrial life.

Terrestrial Planets



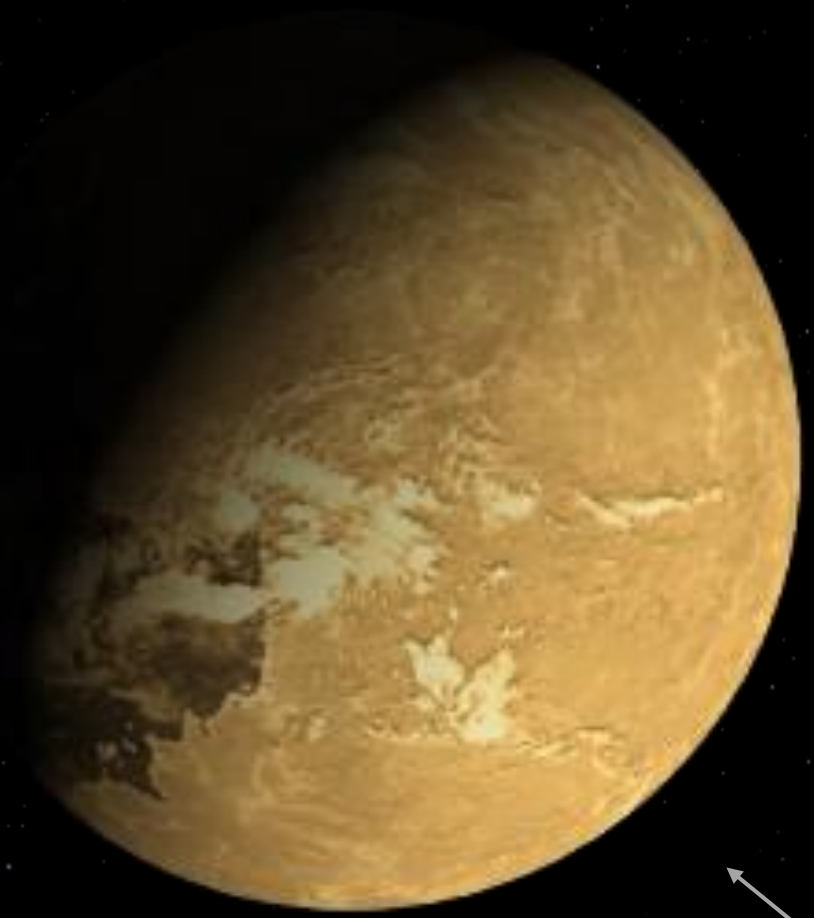
Proxima Centauri b

TRAPPIST-1d

TOI 700 d

Kepler-186f

Proxima Centauri b



Planet Details:

Orbital Period: 11.2 days

Distance from Star: 0.048 AU

Atmosphere: Unconfirmed but potential of Nitrogen, Oxygen, Water vapor and Carbone Dioxide

Temperature Range : -40°C to 30°C

Mass: 1.17 Earth

Surface Conditions: Likely rocky surface with an iron core, potential for liquid water depending on atmosphere.

Expected Surface Minerals: Silicates, iron, and potentially water ice or liquid water.

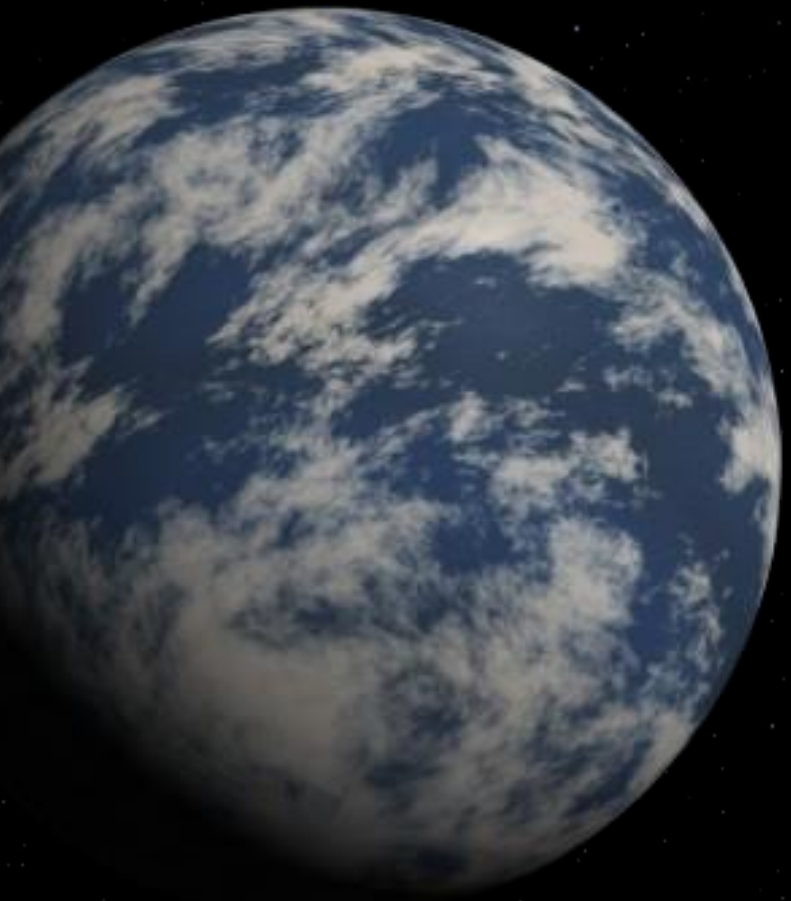
Test Info:

Best Wavelength for Atmospheric Analysis: 20μm

- Best Probe for Temperature Measurement: Standard Probe

- Proxima Centauri b is the closest known exoplanet to Earth and lies within its star's habitable zone, making it a prime candidate for future exploration.

TRAPPIST-1d



Planet Details:

Orbital Period: 4.05 days

Distance from Star: 0.022 AU

Atmosphere Gases: Potential for water vapor, Methane and Nitrogen.

Temperature Range : -65°C to 5°C

Mass: 0.77 Earth

Surface Conditions: Rocky Surface, potentially habitable with the right atmospheric conditions.

Expected Surface Minerals: Silicates, iron oxides and possibly water ice

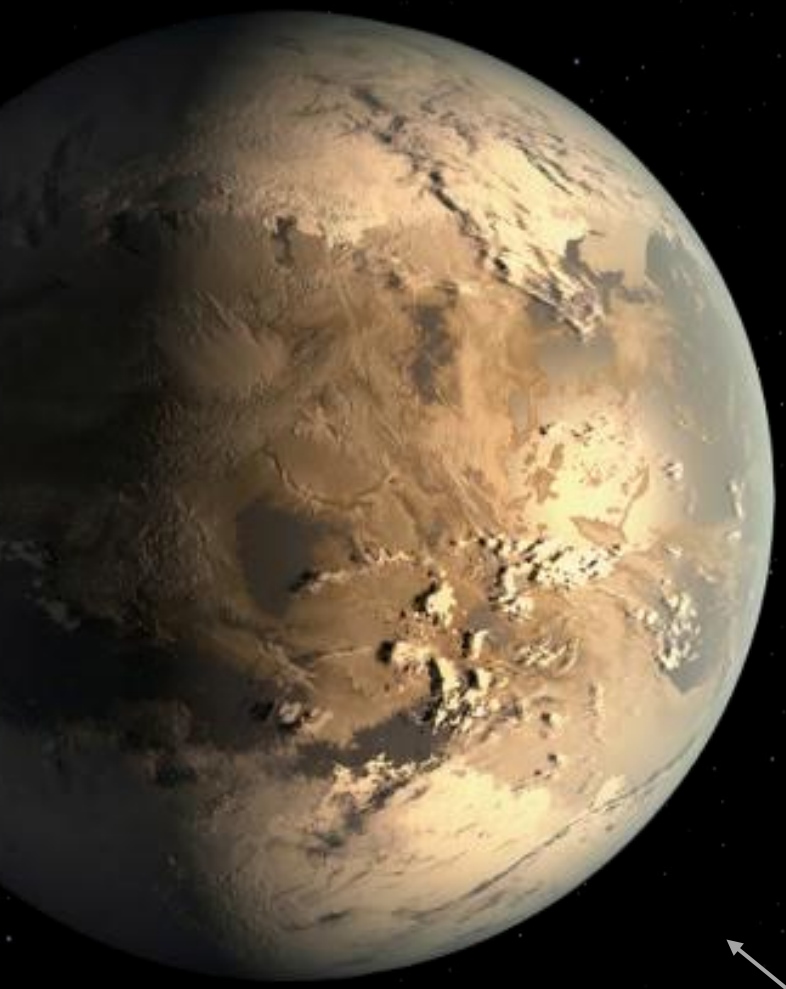
Test Info:

Best Wavelength for Atmospheric Analysis: 20μm

Best Probe for Temperature Measurement: Standard Probe

- Part of a seven-planet system, TRAPPIST-1d is in the habitable zone and may have conditions suitable for liquid water.

Kepler-186f



Planet Details:

Orbital Period: 129.9 days

Distance from Star: 0.4 AU

Atmosphere: Unconfirmed but potential of Nitrogen, Oxygen, Water vapor.

Temperature Range : -40°C to 10°C

Mass: 1.17 Earth

Surface Conditions: Likely rocky surface, possible presence of liquid water and potential of tectonic activity.

Expected Surface Minerals: Silicates, carbonates, and possibly water ice or liquid water.

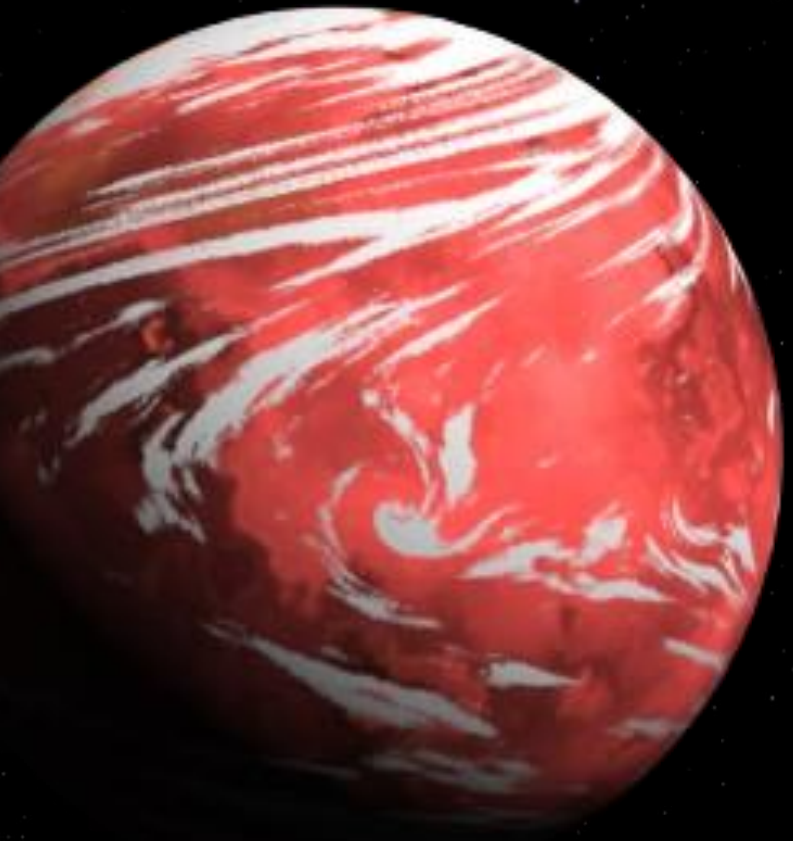
Test Info:

Best Wavelength for Atmospheric Analysis: 20μm

Best Probe for Temperature Measurement: Standard Probe

- Kepler-186f is the first Earth-sized exoplanet discovered in the habitable zone of its star, suggesting the potential for liquid water.

TOI 700 d



Planet Details:

Orbital Period: 37.4 days

Distance from Star: 0.163 AU

Atmosphere Gases: Unconfirmed but potential of Nitrogen, Oxygen, Water vapor and Carbone Dioxide

Temperature Range : -80°C to 10°C

Mass: 1.1 Earth

Surface Conditions: Likely rocky surface with core of heavy metals, potential for liquid water under suitable conditions.

Surface Minerals: Silicates, iron, and potentially water in liquid or ice form.

Test Info:

Best Wavelength for Atmospheric Analysis: 20μm

- Best Probe for Temperature Measurement: Standard Probe

- TOI 700 d is an Earth-sized planet in its star's habitable zone, discovered by NASA's TESS mission, and is one of the most promising candidates for studying conditions suitable for life.

Tests

1) Atmospheric Composition Analysis:

- By this test you will know about the gases in atmosphere.
- ➢ By using the spectrometer you will choose the right wavelength for planet you.

"Maybe you will try many times to know.."

2) Surface Temperature Measurement:

- By this test you will know about Temperature of planet.
- ➢ By Deploying Probe. But there is 3 types of Probes:
  1. Standard Probe: Basic temperature measurement.
  2. High-Temperature Probe: For Extreme Environment
  3. Deep probe: Designed to penetrate the surface and measure subsurface temperatures.

★Probe is a bot used to measure planet temperature, invented on 2198 by a scientist named Heisenberg.

More details on the scientist watch breaking bad Documentary

"Will give reading if there a surface"

!)Note that you have limitation you will have: 3 Standard, 3 High, 1 Deep probe

Tests

3) Radar imaging:

- By this test you will know about the Surface condition and Expected minerals of planet.

➢ You will have 2 ways to do it

1. By low frequency Radar: It will give you few info about planet.
2. By High frequency Radar: It will give you all planet info.

Unfortunately Radar imaging test consume to much energy so you will have a limit like:

Low frequency: 5 High frequency: 2

4) Transit Analysis:

- By this test you will know about Mass, Orbital period, Distance between planet and his star.

➢ You will have 3 ways to do it

1. Short Observation: It will give you 1 info about planet.
2. Medium Observation: It will give you 2 info about planet.
3. Long Observation: It will give you all planet info.

Unfortunately as Radar imaging test, it also consume to much energy so you will have a limit like:

Short Observation: 5 Medium Observation: 3 Long Observation: 1

1 Day in game = 1 minute in real ife