**Beyond sunlight: An aquatic chemosynthetic world**

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Brief Overview:

* Name:
* Type: Ocean World (Water-rich exoplanet)
* Size: Slightly larger than the Earth, with a diameter of 14,000 km
* Location: 0.2 astronomical units away from its red dwarf, it in the habitable zone, detected in the Aquarius constellation, approximately 29 light-years away from Earth with an orbital period of about 40 Earth days (close orbit due to the dimness of the red dwarf).
* Atmosphere: Thick, mostly nitrogen and carbon dioxide, with trace amounts of methane and hydrogen sulfide.

(Composition: Nitrogen (70%), Carbon Dioxide (20%), Methane (5%), Hydrogen Sulfide (3%), Trace Gases (2%))

* Surface: The whole planet is covered by a deep ocean that is between 5 to 500 kilometers deep. There are no large land areas or continents, just small volcanic islands scattered here and there, formed by underwater volcanic activity.
* Temperature: Cold on the surface (~0 to 10°C), but a whole lot warmer at the depths near hydrothermal vents and underwater volcanic activity (up to 400°C).
* Light: Little to no sunlight reaches the ocean depths. The surface receives faint red light due to the star’s lower output, forcing the planet to depend on chemosynthesis instead of photosynthesis to thrive.

The science behind it all:

Now, because planet x orbits a red dwarf star (which is much dimmer than our Sun), sunlight barely reaches its surface. So, how does life survive without sunlight for energy? **chemosynthesis**

On Earth, plants and other life forms use **photosynthesis**, which means they take sunlight and turn it into food. But planet x’s oceans are too dark for that, especially near the bottom, where it’s pitch black and super cold.

Instead, the creatures rely on **chemosynthesis**—basically, they "eat" chemicals instead of sunlight! The energy comes from the **hydrothermal vents** (volcano-like cracks on the ocean floor) that spew out hot water and chemicals like **hydrogen sulfide** and **methane** (the stuff in gas for cooking).

Tiny bacteria living near these vents "eat" these chemicals and turn them into food and energy, just like how plants use sunlight. These bacteria are the **base of the food chain**—they’re like the plants of the planet.

The oceans stay liquid (not frozen) thanks to something called **tidal heating**. It works like this: Cethon is constantly pulled and stretched by its nearby star, creating **friction** deep inside the planet. This friction heats things up, kind of like when you rub your hands together fast and they get warm.

This heat powers the hydrothermal vents and keeps the ocean warm enough for life to exist. Without tidal heating, the planet would be a frozen wasteland, and the whole chemosynthesis party would be over!