

Ocean Worlds: Planetary Oceans and Earth's Marine Ecosystems

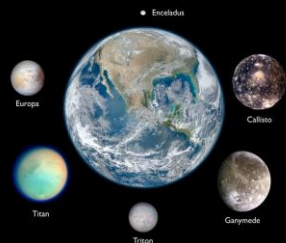
Introducing a comparative exploration of planetary oceans and the significance of Earth's oceans.

What can we learn from exploring planetary oceans, and how does it relate to our understanding of Earth's oceans?

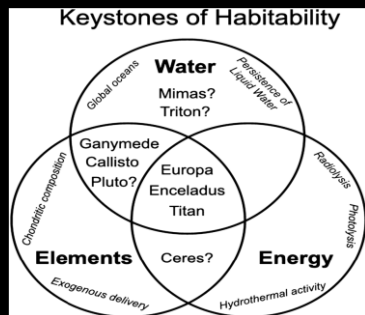


The Astrobiology approach: Planetary oceans provide an opportunity to explore the conditions that may have led to the emergence of life. Studying the chemical composition and potential biosignatures in these environments contributes to the broader field of astrobiology and our understanding of life's origins.

Water as a Resource: Water is a critical resource, and the presence of planetary oceans raises questions about the potential availability of water for future human exploration and colonization. The study of planetary oceans contributes to our understanding of resource distribution in the solar system.

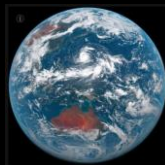


A celestial body qualifies as an "ocean world" if there is a credible indication or confirmed evidence of a liquid ocean. Oceans are not exclusive to Earth; other possible candidates in our solar system, like Europa, Enceladus, and Titan, have been recognized as having liquid oceans.

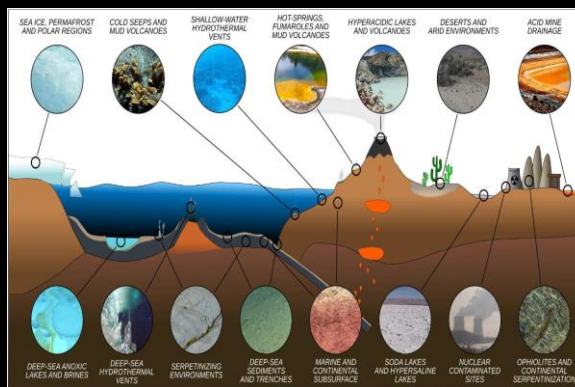


What is Habitability? Studying planetary oceans helps scientists understand the conditions necessary for habitability. This includes the presence of liquid water, stable environments, and the chemical elements and compounds required for life. The three main pillars essential for sustaining life are the availability of liquid water, the necessary elements for life construction, and a viable energy source.

What about our Ocean World – Earth?

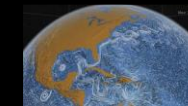


Earth's oceans cover the majority of our planet's surface and are essential for the planet's functioning, supporting life, regulating the climate, and providing various benefits to human societies.



Did you know Earth has extreme environments?

Within Earth's environments, there exist a multitude of complex habitats, some of which are so extreme that the survival of any life there seems highly unlikely. Nevertheless, life endures through remarkable adaptations, enabling it to thrive in these challenging conditions. Currently, NASA scientists are researching extreme environments on Earth, utilizing them as partial analogs for conditions found on other ocean worlds.



How do oceans affect Earth's climate?

Oceans act as regulators of the Earth's climate. They absorb and store heat, influencing weather patterns and helping to maintain a stable global climate. The exchange of heat between the ocean and the atmosphere is a critical factor in shaping regional and global climate systems.

The Climate Crisis



The **Climate Crisis** poses a significant threat to marine systems due to human activities like deforestation and fossil fuel burning, resulting in rising global temperatures and warming ocean waters. This disruption exacerbates extreme weather events and ocean acidification, harming marine life and ecosystems. Urgent action to address the **Climate Crisis** through sustainable practices, emissions reduction, and global collaboration is essential to safeguard the health and stability of our oceans and the planet's overall well-being.

How will NASA track Earth's climate?

NASA's PACE mission, short for Plankton, Aerosols, Clouds, and Ocean Ecosystem, is a satellite set to monitor ocean ecosystems and atmospheric properties.



Why does PACE matter?

It's a key to unlocking the secrets of carbon in our Earth system. Carbon is a vital part of Earth's climate system, contributing to the planet's temperature control. PACE is our guide to understanding how carbon travels globally and how human actions influence its path, providing essential insights into our planet's health.