



How big is the Ocean, really?

2.5:1

The ocean is big. Really big. Quantifying how big specifically, requires varied perspectives allowing us to define it's size using a range of metrics. From these perspectives we begin to understand just how 'big' the ocean actually is.

A dramatic, low-angle photograph of a massive ocean wave curling over, illuminated from below, creating a glowing effect. The water is a deep blue-green color, and the spray is white and misty. The background is dark, making the wave stand out.

DEEP NOTES

Overview

The size of the ocean can be described in both 2 and 3 dimensions

The ocean to land surface area ratio is **2.5 : 1.0**

The total surface area of the ocean is **361.9 million km²**

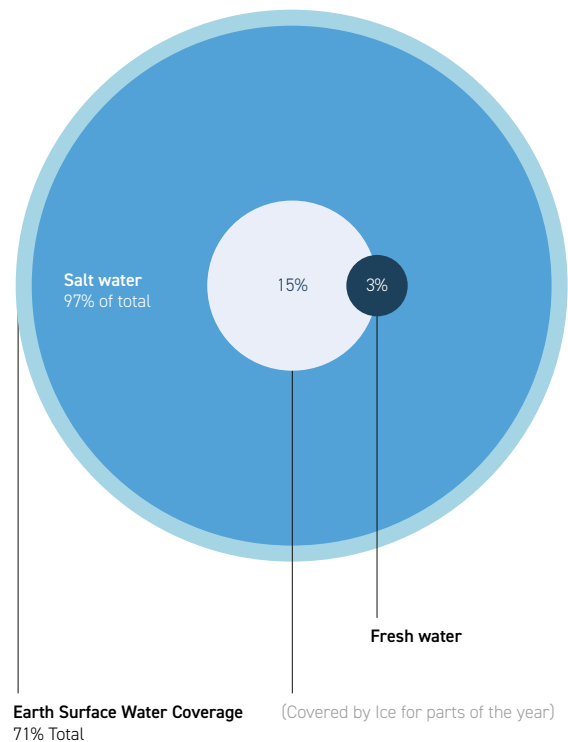
The total volume of the ocean is **1.332 billion km³**

Background

The ocean is a vast expanse of water that covers the majority of the Earth's surface. Approximately 71% of our planet's surface is covered with water, with the remaining 29% being the land that we live on. This makes the ocean to land surface area ratio ~2.5:1 in favour of the oceans. As shown by Figure 1, 97% of the water found on our planet is in our oceans. However, as 'ocean' refers to the collective body of non-fresh water on the earth, the variable depth of this water should also be taken into account.



FIGURE 1:



Salt water vs Fresh water share^[1]

IN 2 DIMENSIONS

We exist on a relatively flat boundary between solid and gas, and there our perception of size from a base-level is to measure space laterally as an area (for example, km^2).

In terms of actual ocean surface area, according to the National Oceanic and Atmospheric Administration (NOAA), the ocean covers approximately $361,900,000 \text{ km}^2$ ^[2], which is about 25 times the surface area of the entire Moon^[3].

The Atlantic Ocean covers an area of about $106,400,000 \text{ km}^2$, the Indian Ocean covers approximately $73,500,000 \text{ km}^2$, and the Southern Ocean covers around $20,300,000 \text{ km}^2$. The Arctic Ocean is the smallest of the five oceans, with a surface area of approximately $14,050,000 \text{ km}^2$, while the Pacific Ocean is the largest, covering approximately $168,700,000 \text{ km}^2$. While these figures are widely accepted, it is worth noting that they do vary slightly depending on the source; precise measurements are difficult to obtain due to the presence of islands, the irregular shape of ocean basins and constantly changing coastlines.

IN 3 DIMENSIONS

While the surface area of the ocean gives an idea of size as analogous to land, its volume is perhaps of greater relevance when trying to understand how 'big' it is. Water is much more dense than air and therefore another dimension is available for occupancy; the habitable space increases due to the ability for organisms to more easily move vertically. The depth of the ocean varies greatly depending on the location. The deepest known region is the Challenger Deep in the Mariana Trench, located in the Western Pacific Ocean. The Challenger Deep reaches a depth of $\sim 10,935 \text{ m}$, compared to the average depth of the world's oceans of $\sim 3,688 \text{ m}$.

According to the United States Geological Survey (USGS), the total volume of water in the world's oceans is approximately $1,332,000,000 \text{ km}^3$.^[4] A person drinking the recommended 1.5 L of water a day would take $2,432,876,712,328,800,000$ years (or $176,295,414 \times$ the age of the universe) to consume this much. To look at this from another perspective, if you were to drain the entire ocean and spread the water evenly over the Earth's land surface ($148,326,000 \text{ km}^2$), it would cover the planet with a layer of water almost 9 km deep.

MASS

Once we understand the volume of the ocean, we can start to comprehend the mass and weight. Using a density of 1037 kg/m^3 , we can calculate the mass of the ocean to be approximately $1,381,284,000,000,000,000 \text{ kg}$ or almost one fifth the mass of the Moon.


CONCLUSION

The ocean is big. It is so big that to even quantify it in mundane units of measure borders on ludicrous. The ocean dominates our planet's surface, and the added dimension of depth makes its sheer size difficult for a land-dwelling mammal to comprehend. However, the scale of the ocean is also its allure; exploring this vast entity will provide an essential new perspective on our planet. Descending to the depths will broaden our horizons.

— References

- [1] _the Earth, Earth Facts - Nations Online Project, Kästle, K. (2023). Available at: <https://www.nationsonline.org/oneworld/earth.htm#:~:text=Total%20Surface%20Area%3A%20about%20509,total%20surface%20of%20the%20Earth>. (Accessed: 14 August 2023).
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- [3] How big is the moon?, Space.com (Sharp et al.,) (2022). Available at: <https://www.space.com/18135-how-big-is-the-moon.html>
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