



NOAA Global Ocean Carbon Observing Network

The ocean represents 71% of the Earth's surface, 97% of the Earth's water, and is inextricably linked to climate.

The ocean regulates climate by acting as a carbon sink and absorbing carbon dioxide (CO₂) from the atmosphere. Over time, the ocean has absorbed more and more carbon, leading to negative impacts on marine ecosystems and the U.S. economy. **But how much carbon can the ocean absorb? How is carbon uptake changing the ocean chemistry, and can humans control future ocean carbon storage?** NOAA's Global Ocean Carbon Network is working to answer these questions with research and long-term observations of carbon from the sea surface to the ocean floor, conducted through the international Global Ocean Ship-Based Hydrographic Investigations Program (GO-SHIP) and the Surface Ocean CO₂ Reference Observing Network (SOCO₂NET). Sustained and improved ocean carbon research can better inform ecosystem and fisheries management, coastal and city planning and climate mitigation and adaptation policy.

How important is the ocean when it comes to climate?

- ◆ A major service the ocean provides is the uptake of CO₂. It is estimated that **the ocean absorbs 25% of CO₂ emissions per year**. Without the ocean, the atmosphere would be *even warmer* than it is today.
- ◆ Based on the estimated social cost and economic value of carbon at \$51 per ton, the ocean's uptake of CO₂ is worth about **\$515B per year, or \$1.4B each day!**

NOAA's Leadership Role: NOAA is at the forefront of ocean chemical, physical, and biological monitoring in support of ocean carbon cycle observations and research. NOAA is a leader in quantifying global ocean carbon uptake and **provides 50% of global ocean carbon observations**. NOAA plays an important and influential role in organizing international efforts to address global challenges.



CTD Rosettes (pictured above) measure conductivity, temperature, carbon dioxide and depth throughout the water column.



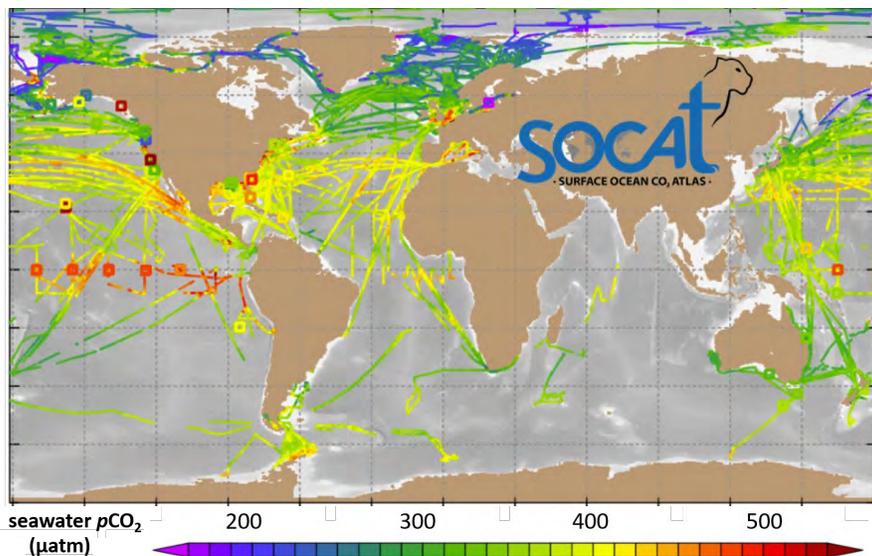
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By absorbing carbon dioxide, the ocean protects us from more extreme climate conditions.

Accurate knowledge about where fossil fuel CO₂ emissions are coming from and where they are going is critical to supporting development of climate policies and projecting future climate.



All surface ocean CO₂ observations made over a five year time frame.

International Engagement

Tracking the sources and sinks of CO₂ is required to assess progress towards achieving the long-term goals of the [Paris Climate Agreement](#). NOAA currently provides atmospheric and oceanic observations of CO₂ to international efforts to determine the global carbon budget on an annual basis. Some of the efforts NOAA contributes to include:

- The Surface Ocean CO₂ Atlas, or [SOCAT](#) (pictured left), provides an annual high quality global assessment of ocean CO₂ uptake estimates.
- National and international annual reports and assessments such as: [BAMS State of the Climate](#), the [Global Carbon Project](#) and the [IPCC](#).
- Participation in the Global Ocean Observing System ([GOOS](#)).

The ocean carbon science-to-society value chain could be enhanced through:



Improving Sensor Technology

NOAA is developing and deploying new sensors and platforms for measuring the most challenging and inaccessible places in the world, including the seasonally ice-covered Arctic Ocean, the Bering Sea, and the remote and climatically important Southern Ocean around Antarctica. These sensors can measure the ocean at a fraction of the cost of sending crewed research vessels.



Filling in Observational Gaps

Much of the globe's research assets are in the Northern Hemisphere, leaving huge gaps in access to ocean information in the Southern Hemisphere. This represents a climate equity challenge that can be met with improved sensor technology and key partnerships. NOAA is working with people and organizations around the world to lead and foster global ocean carbon data collection and access.



Carbon Dioxide Removal Research

Carbon dioxide removal (CDR) is increasingly being recognized as a strategy to meet the nation's climate goals. Many of the most promising approaches for CDR involve the ocean, but most of these strategies are untested. An increase in ocean monitoring is urgently needed to verify that ocean-based CDR approaches are both effective and safe for coastal communities.



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