

Ocean skin helps regulate ocean carbon uptake, study finds

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New research investigates how the carbon cycle functions in the upper layer of the ocean, seen here in a long-exposure photograph of the Caribbean Sea. Credit: [Martin Falbisoner/Wikimedia Commons, CC BY-SA 4.0](#)

At less than one millimeter thick, the ocean skin—the ocean's uppermost layer—plays an outsized role in marine processes, orchestrating heat and chemical exchange between the sea and sky via diffusion. The water of the skin is cooler by about 0.2–0.3 K and has higher salinity than the

water at even just 2 millimeters depth.

Since it was first described in 1967, scientists have grappled with the skin's influence on [carbon uptake](#) and the global [ocean](#) carbon sink. Understanding its role is critical: Between 2011 and 2020, the ocean absorbed 26% of all human-generated carbon dioxide emissions, and variables that affect ocean carbon sequestration contribute to governing the [carbon cycle](#) and [climate change](#).

Hugo Bellenger and colleagues have toggled oceanic temperature and salinity gradients to represent the ocean skin over 15 years (2000–2014) in an Earth system model, assessing how these changes altered the amount of carbon absorbed by the ocean. The work, published in the *Journal of Geophysical Research: Oceans* represents the first model-based estimate of the ocean skin's influence on ocean–atmosphere carbon dioxide exchange.

Including the representation of the skin in the Earth system model led to a 15% increase in the simulated ocean carbon sink, the researchers found—a figure consistent with past estimates. However, when they allowed the ocean skin to respond to changing ocean carbon concentrations in the model, the effect on the sink was substantially reduced. With the dynamic skin, its contribution to the simulated ocean carbon sink was closer to 5%.

The research shows the importance of including the ocean skin in future climate and carbon modeling efforts, the authors say. And it demonstrates that an interactive parameterization of the ocean skin yields a more accurate model that reduces regional errors in carbon dioxide flux.

More information: Hugo Bellenger et al, Sensitivity of the Global Ocean Carbon Sink to the Ocean Skin in a Climate Model, *Journal of*

Geophysical Research: Oceans (2023). [DOI: 10.1029/2022JC019479](https://doi.org/10.1029/2022JC019479)

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