

Ocean carbon uptake widely underestimated

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The world's oceans soak up more carbon than most scientific models suggest, according to new research.

Previous estimates of the movement of carbon (known as "flux") between the atmosphere and oceans have not accounted for [temperature](#) differences at the water's surface and a few metres below.

The new study, led by the University of Exeter, includes this—and finds significantly higher net flux of carbon into the oceans.

It calculates CO₂ fluxes from 1992 to 2018, finding up to twice as much net flux in certain times and locations, compared to uncorrected models.

"Half of the carbon dioxide we emit doesn't stay in the atmosphere but is taken up by the oceans and land vegetation 'sinks'," said Professor Andrew Watson, of Exeter's Global Systems Institute.

"Researchers have assembled a [large database](#) of near-surface carbon dioxide measurements—the "Surface Ocean Carbon Atlas" (<http://www.socat.info>) - that can be used to calculate the flux of CO₂ from the atmosphere into the [ocean](#).

"Previous studies that have done this have, however, ignored small temperature differences between the surface of the ocean and the depth of a few metres where the measurements are made.

"Those differences are important because carbon dioxide solubility depends very strongly on temperature.

"We used [satellite data](#) to correct for these temperature differences, and when we do that it makes a big difference—we get a substantially larger flux going into the ocean.

"The difference in ocean uptake we calculate amounts to about 10 per cent of global fossil fuel emissions."

Dr. Jamie Shutler, of the Centre for Geography and Environmental Science on Exeter's Penryn Campus in Cornwall, added: "Our revised estimate agrees much better than previously with an independent method of calculating how much carbon dioxide is being taken up by the ocean.

"That method makes use of a global ocean survey by research ships over decades, to calculate how the inventory of carbon in the ocean has

increased.

"These two 'big data' estimates of the ocean sink for CO₂ now agree pretty well, which gives us added confidence in them."

The paper, published in *Nature Communications*, is entitled: "Revised estimates of ocean-atmosphere CO₂ flux are consistent with ocean [carbon](#) inventory."

More information: "Revised estimates of ocean-atmosphere CO₂ flux are consistent with ocean carbon inventory," *Nature Communications* (2020). [DOI: 10.1038/s41467-020-18203-3](https://doi.org/10.1038/s41467-020-18203-3)

Provided by University of Exeter

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