



“We found that phytoplankton were either limited by either iron or by nitrogen, which led to really distinct properties in phytoplankton fluorescence as detected by satellites. We also found that the intensity of iron limitation also influenced fluorescence signals: More intense iron limitation resulted in more fluorescence”, summarises Dr. Browning. Fluorescence observations from the satellites varied in a way that matched the supply of iron upwelled from deeper waters over ENSO cycles.

When they compared their observations to predictions made by a global biogeochemical model, the researchers found a striking difference: Changes in iron limitation were coherent with ENSO dynamics over multiple cycles. But the model overestimated the impact on phytoplankton iron limitation twofold compared to field observations. In this way, these types of synoptic observations of nutrient limitation from satellites may be key to validating and improving such models – and to better predict the impacts of future climate change on ocean ecosystems.

“These first findings demonstrate how satellite observations can help us assess the impact of nutrient limitations on phytoplankton and their important role in the global ocean and our climate system”, emphasises Dr. Browning. “However, our study was focussed on the Equatorial Pacific. With the new ERC project ‘Ocean Glow’, we plan to validate this much more robustly for all regions of the ocean.”

#### **Original publication:**

Browning, T.J., Saito, M.A., Garaba, S.P, Wang, X., Achterberg, E.P., Moore, M., Engel, A., Mcllvain, M.R., Moran, D., Voss, D., Zielinski, O., Tagliabue, A. (2023): Persistent equatorial Pacific iron limitation under ENSO forcing. Nature, doi: <https://doi.org/10.1038/s41586-023-06439-0>

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#### **Background: Ocean Glow**

The recently started project “Ocean Glow” aims to investigate the potential for observing ocean nutrient limitation globally using satellite-detected phytoplankton fluorescence signals. It is led by Dr. Thomas Browning marine biologist and chemist at GEOMAR Helmholtz Centre for Ocean Research Kiel (Germany) and supported by a Starting Grant from the European Research Council (ERC) of 1.5 million Euros.

#### **Links:**

[www.icbm.de](http://www.icbm.de) Institute for Chemistry and Biology of the Marine Environment (ICBM) at the University of Oldenburg

<https://www.io-warnemuende.de> Leibniz Institute for Baltic Sea Research, Warnemünde (IOW)

<https://www.whoi.edu> Woods Hole Oceanographic Institution

<https://www.southampton.ac.uk> University of Southampton

<https://www.liverpool.ac.uk/earth-ocean-and-ecological-sciences> Department of Earth, Ocean and Ecological Sciences at the University of Liverpool

<https://www.lfd.uni-hamburg.de/sonne/wochenberichte/wochenberichte-sonne/so267-2-268-3/so267-2-scr.pdf> Cruise report SONNE expedition SO267/2

<https://oceancolor.gsfc.nasa.gov> National Aeronautics and Space Administration (NASA) Ocean Colour website

<http://www.geomar.de/n8254-e> GEOMAR Press release: “Ocean Glow” to shed new light on the controls of ocean productivity (10.01.2022)

<https://www.geomar.de/en/discover/ocean-and-climate/climate-change-in-the-ocean/el-nino-in-a-changing-climate> GEOMAR Discover: How does El Niño Change in a Changing Climate?

#### **Images:**

Images are available for download at [www.geomar.de/n9074-e](http://www.geomar.de/n9074-e)

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