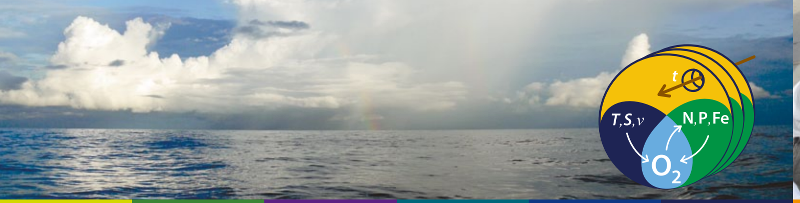

SFB 754

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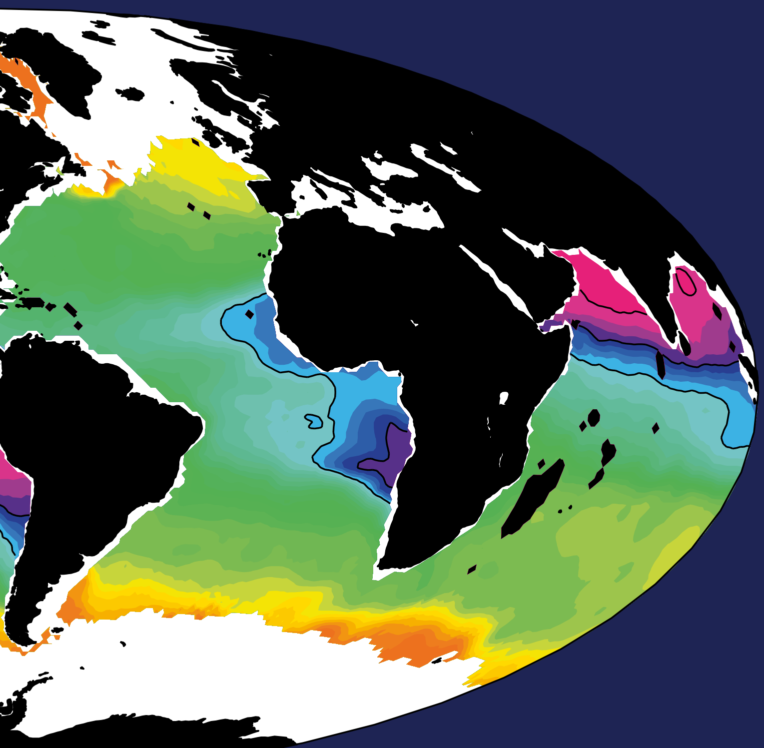

CAU | GEOMAR | DFG

SUBPROJECTS

The SFB 754 consists of 16 scientific interdisciplinary subprojects that are designed to answer the key questions of the SFB 754.

The SFB 754 involves scientists from the Christian-Albrechts University Kiel (CAU), GEOMAR Helmholtz Center for Ocean Research Kiel and the Max-Planck-Institute Bremen.

A — CIRCULATION AND OXYGEN

Cretaceous & Holocene | Last Century | Modern & Future

OXYGEN SUPPLY

- **A3** Tanhua / Visbeck — Oxygen supply tracer release experiment
- **A4** Brandt / Körtzinger / Greatbatch — Trends and variability of oxygen inventory and supply in eastern boundary OMZs
- **A5** Stramma / Frank — Water mass structure in the eastern tropical Pacific Ocean: relationship to oxygen variability and geochemical properties
- **A8** Scholten / Dengler — Transport and fluxes across the bottom boundary layer

PALEO PERSPECTIVE

- **A6** R. Schneider / Nürnberg / Frank — Influence of centennial to millennial scale climate change on low-latitude OMZ conditions
- **A7** Kuhnt / Wallmann — Unraveling the onset and spread of Cretaceous anoxia

MODELLING AND SYNTHESIS

- **A1** B. Schneider / Latif — Simulating the spatio-temporal variability of OMZs from the Holocene to the Anthropocene
- **A2** Böning / Oschlies — High-resolution modelling of physical-biogeochemical interactions in the tropical ocean
- **B1** Oschlies / Dale — A global model of redox-dependent biogeochemical cycles

B — REDOX-DEPENDENT BIOGEOCHEMISTRY

PELAGIC BIOGEOCHEMISTRY

- **B2** Riebesell / Pahlow — Photoautotrophic responses to changes in nutrient stoichiometry
- **B4** Schmitz-Streit / Kuypers / Bange — Nitrogen losse and nutrient regeneration in OMZ waters
- **B8** U. Sommer / Melzner — The role of zooplankton in N-, P- and C-cycling and the oxygen budget of tropical OMZs
- **B9** Engel / Kanzow — Near-coastal supply of oxygen and dissolved organic matter to the OMZ

BENTHIC BIOGEOCHEMISTRY

- **B5** Hensen / Wallmann — Biogeochemical cycling of iron and phosphate under low oxygen conditions
- **B6** Treude / S. Sommer / Dullo — Nitrogen turnover and fluxes across the benthic boundary layer under varying redox conditions
- **B7** Schönfeld / Eisenhauer — Reconstruction of past oxygenation and redox conditions

- **Ö** Dengg — Outreach
- **Z** Oschlies / R. Schneider — Coordination
- **Z** Stramma / Körtzinger — Research expeditions

OMZ = Oxygen Minimum Zone

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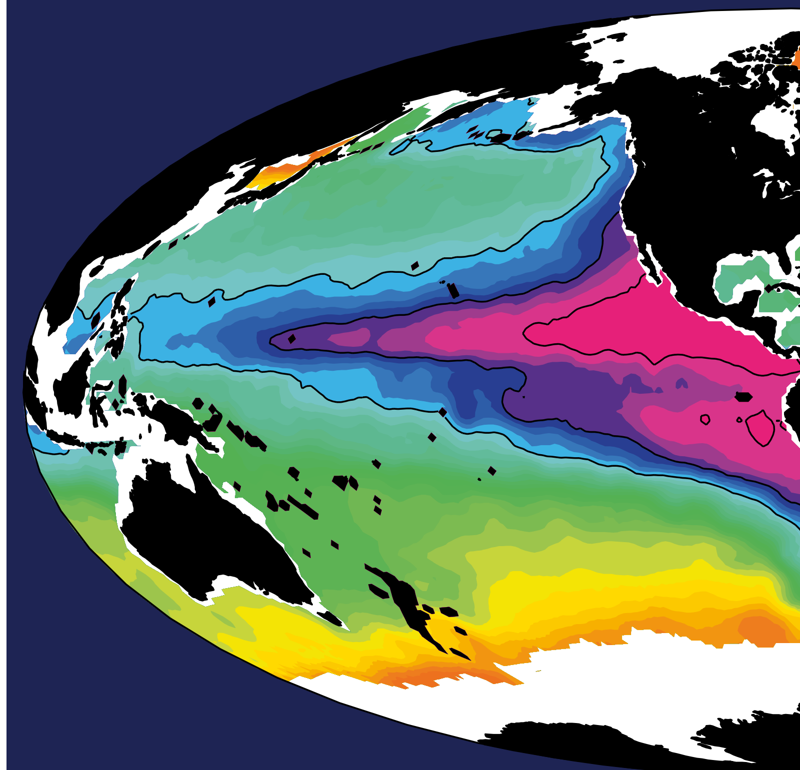
The Collaborative Research Centre 754 (SFB 754) is funded by the German Research Foundation (DFG) since 2008.

SFB 754

Climate – Biogeochemistry Interactions in the Tropical Ocean



Sonderforschungsbereich 754
Collaborative Research Centre 754

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OVERALL GOALS OF THE SFB 754

- Improve understanding of the coupling of tropical climate variability and circulation with the ocean's oxygen and nutrient balance
- Quantitatively evaluate the nature of oxygen-sensitive processes
- Assess consequences for the ocean's future

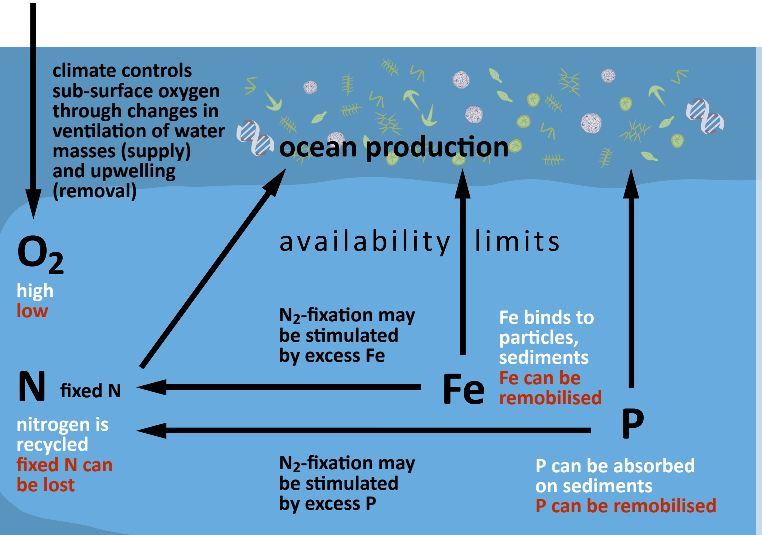
HIGHLIGHTS

- A high-resolution model indicates major role of equatorial and off-equatorial undercurrents in setting oxygen levels in the eastern tropical Atlantic Ocean.
- First in-situ observation of energetic large-amplitude non-linear internal waves and associated mixing along the continental slope and shelf of the Peruvian upwelling region.
- Observational confirmation of spatial/temporal coupling between N-loss processes and N_2-fixation.
- Successful modelling of non-Redfield stoichiometry in phytoplankton.
- The supply pathways, both lateral and horizontal, for oxygen to the core of the OMZ have been quantified, with the vertical flux contributing about 1/3 of the total flux.
- Atmospheric CO_2 drives geochemical cycling and is a key to understand Cretaceous Oceanic Anoxic Events (OAEs).
- The pore density in benthic foraminiferal tests of the species *Bolivina spissa* from the Peruvian Upwelling was found to reflect nitrate availability in ambient seawater since the pores are associated with respiration.

For more information visit:
www.sfb754.de

THE KEY QUESTIONS OF THE SFB 754

- How does subsurface dissolved oxygen in the tropical ocean respond to variability in ocean circulation and ventilation?
- What are the sensitivities and feedbacks linking low or variable oxygen levels and key nutrient source and sink mechanisms? In the benthos? In the water column?
- What are the magnitudes and time scales of past, present and likely future variations in oceanic oxygen and nutrient levels? On a regional scale? On a global scale?



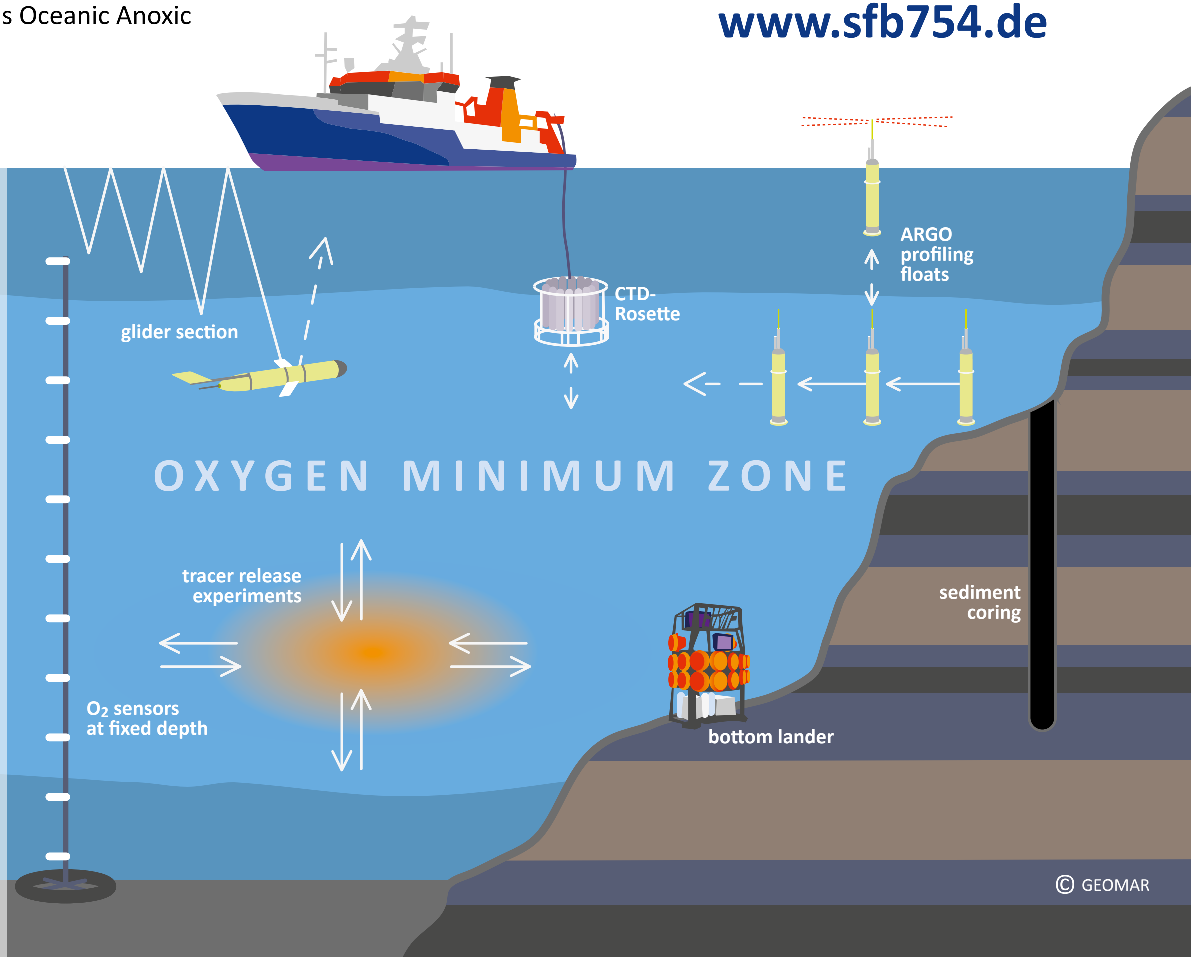
The microbial changes associated with the »oxygen switch« have a major impact on the amounts and chemical forms of the key nutrient elements nitrogen, phosphorus and iron. These nutrients, in turn, help determine ocean biological productivity and the oceanic carbon cycle. The ocean's »oxygen switch« has been thrown on and off many times over geological time, usually in association with major climate changes.

OXYGEN CHANGES

Changes in Oxygen Minimum Zone (OMZ) intensity and extent have occured throughout Earth's history. Past reductions in oceanic O_2 have been associated with warmer climates and higher CO_2.

Is this analogous for the future? What is possible?

The SFB 754 investigates the evolution of the ocean oxygenation during distinct periods of the Cretaceous, from the end of the last glacial to the present, and into the future.



Wrap-around figure: distribution of oxygen at about 300 – 500 m depth (σ_θ=26.9 kg/m³).