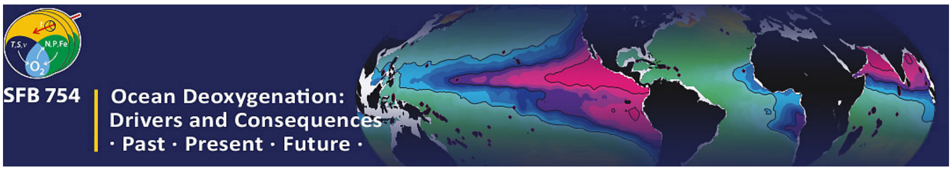

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Benthic N-cycling in the Peruvian Oxygen Minimum Zone in relation to variable bottom water redox conditions

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Oxygen minimum zone (OMZ) sediments were identified as key regions for nitrogen loss as well as for recycling of reactive N species releasing high amounts of ammonium (NH_4^+) into the bottom water and thereby affecting the water column elemental ratios and processes. Despite this significance the response of benthic N-cycling in relation to variability in the bottom water redox scheme, i.e. the availability of oxygen (O_2), nitrate (NO_3^-) and nitrite (NO_2^-), is hardly constrained. We compare previous measurements from austral summer (January 2013), where the bottom water in the upper OMZ has been depleted of O_2, NO_3^-, NO_2^- and even sulfide has been released due to persistent stagnant current conditions, with new measurements that were obtained in austral autumn (April/May 2017) during the passage a coastal trapped wave, which enhanced the southward transport of NO_3^- and NO_2^- and caused a slight ventilation of the bottom water on the shelf. During both campaigns, solute fluxes of NH_4^+, NO_3^- and NO_2^- across the sediment water interface were measured at 9 stations on a depth transect at 12° S in the OMZ off Peru encompassing water depths from 70 to 1000 m using benthic lander in situ incubations. The uptake of NO_3^- by the sediment was reestablished on the shallow shelf in 2017 and elevated (with up to $8 mmol m^{-2} d^{-1}$) in the entire upper OMZ. Despite the significantly different bottom water geochemistry, the NH_4^+ fluxes measured in 2017 were equivalent to 2013 across the transect, with values reaching $21 mmol m^{-2} d^{-1}$ at the shallowest station. As in 2013, the high NH_4^+ fluxes measured in 2017 were predominantly caused by mats of filamentous sulfur bacteria via the dissimilatory nitrate reduction to ammonium pathway and were sustained by high sulfide concentrations in the sediment. We explore implications of enhanced transport of NO_3^- and NO_2^- for the N budget as well as reasons for the unchanged NH_4^+ release from shelf sediments also considering new findings which indicate that sulfidic events off Peru occur more frequently than previously thought.

Position

PhD Candidate

Affiliation

Geomar

Email Address

dclemens@geomar.de

Are you a SFB 754 / Future Ocean member?

Yes

Primary author(s) : Mr CLEMENS, David (Geomar)

Co-author(s) : LÜDKE, Jan (GEOMAR Helmholtz Centre for Ocean Research Kiel); Dr DENGLER, Marcus (GEOMAR - Helmholtz Centre Ocean Research Kiel); Dr DALE, Andrew (Geomar); WALLMANN, Klaus (GEOMAR); Dr SOMMER, Stefan (Geomar)

Presenter(s) : Mr CLEMENS, David (Geomar)

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