Monsoon driven changes in marine biogeochemistry in the Arabian Sea (CARIMA – BMBF Project 762)

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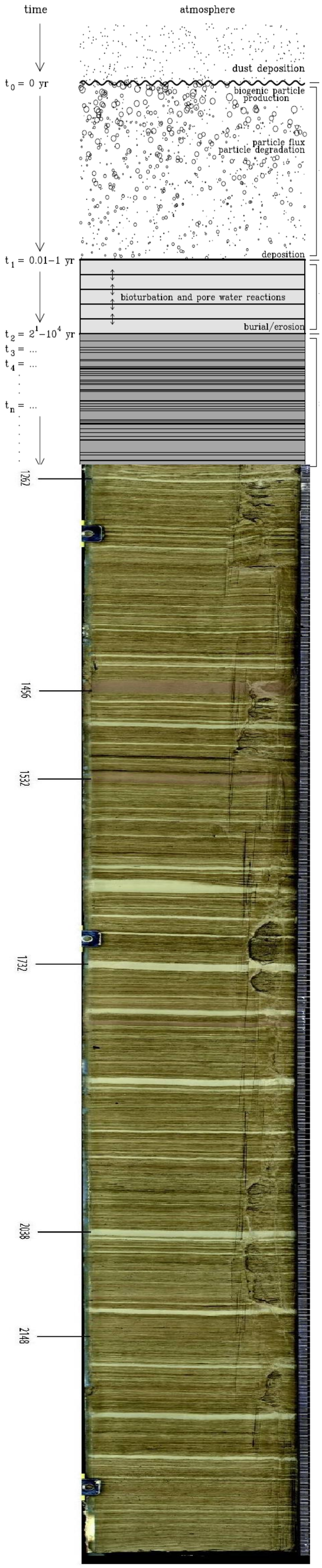


Introduction

Overview

Within the BMBF project CARIMA (4/2011 – 3/2014) the project aims at a better understanding of the Asian Monsoon system including the marine biogeochemistry and its changes in the past as recorded in marine sediments and under forcing by anthropogenic CO_2 emissions by numerical model simulations.

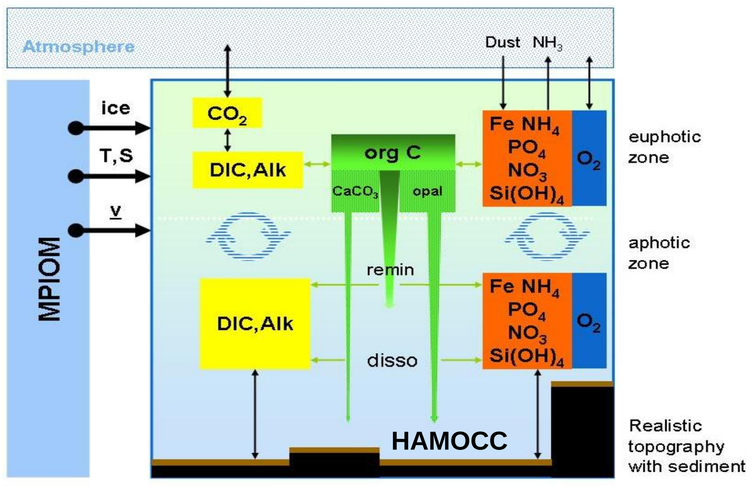
CARIMA is part of the project cluster CAME (Central Asian Monsoon Dynamics and Geo Ecosystems) funded by the WTZ section of BMBF. The work presented here is in progress.

Approach

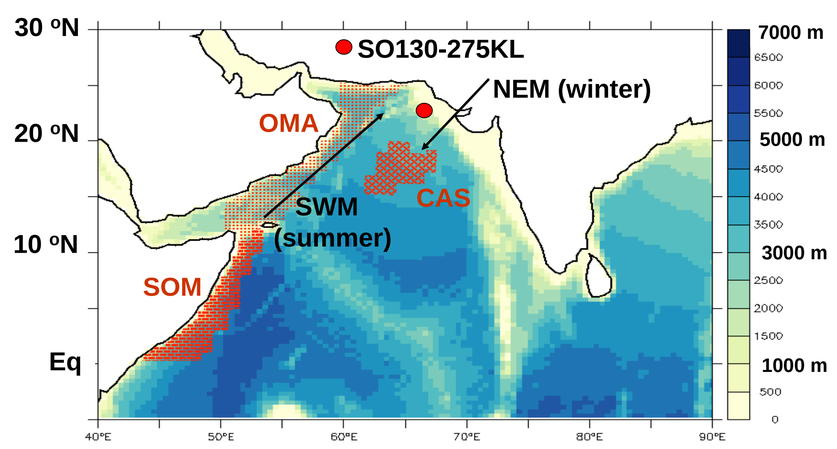
In a first step we employ the numerical model MPIOM/HAMOCC forced by NCEP reanalysis on the TP04 grid (nominal 0.4° horizontal resolution, 40 layers) to analyse correlations between Monsoon forcing and biogeochemical parameters. The aim is to derive a monsoon index from a sediment core taken in the Arabian Sea and provided within CARIMA (the centre section from core SO130-275KL taken off Pakistan is shown to the left). This index is then to be used to force the model. In a parallel effort, we will analyse the CMIP5 past1000 experiment.

Model and research area

Biogeochemical processes in HAMOCC



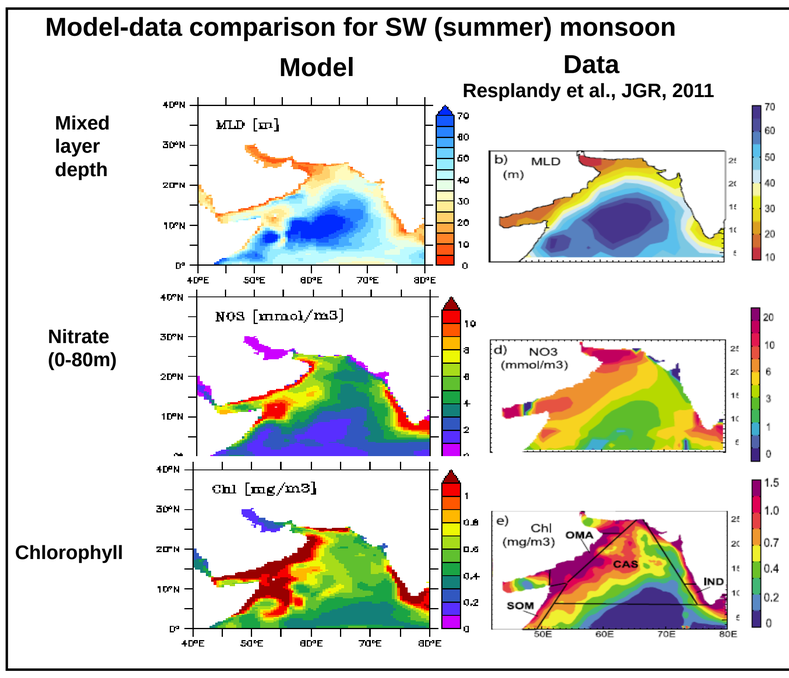
Key regions for analysis and model topography

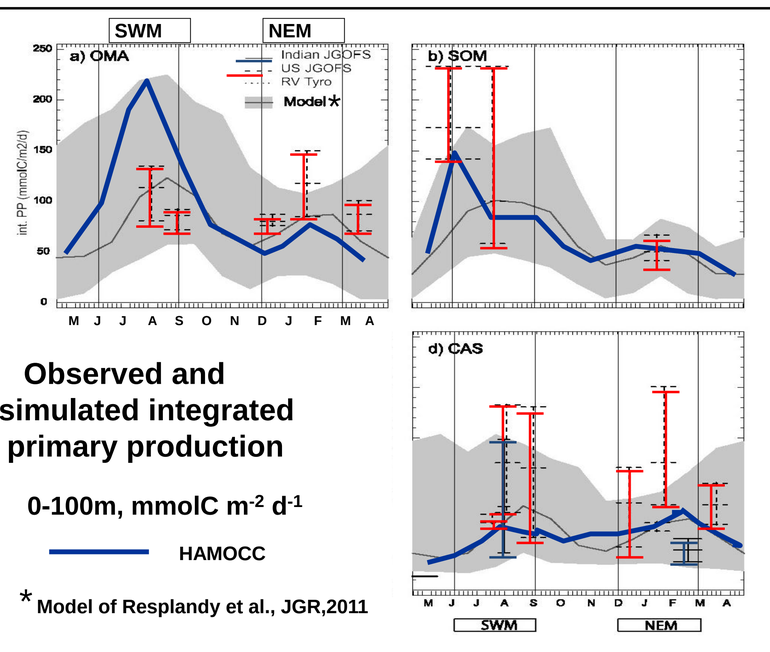


OMA: off Oman, CAS: Central Arabian Sea, SOM: off Somalia
SWM = south west monsoon, NEM = north east monsoon

Model validation

Model-data comparison for SW (summer) monsoon





Observed and simulated integrated primary production

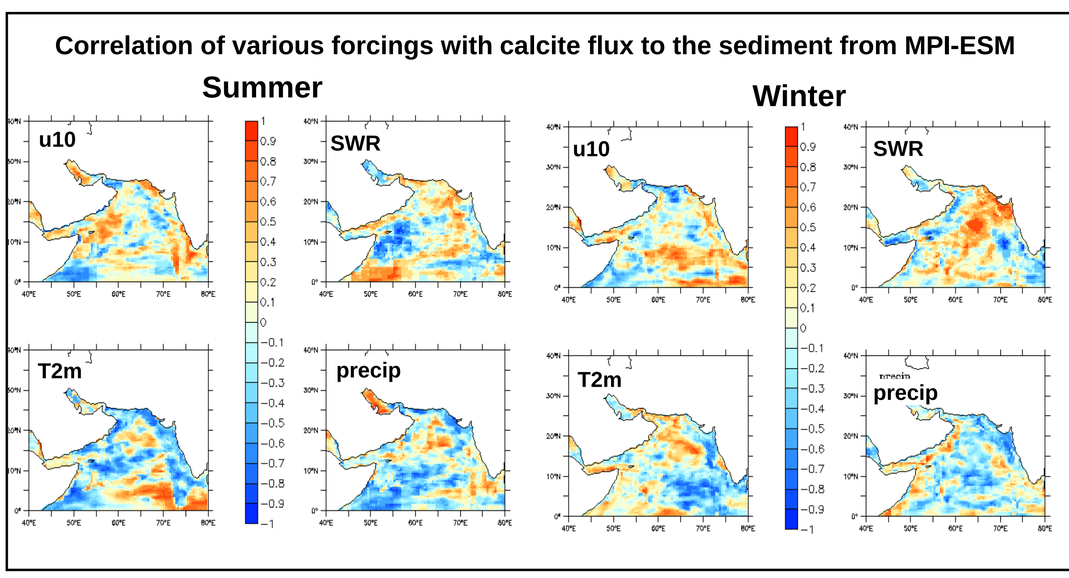
0-100m, mmolC m^{-2} d^{-1}

HAMOCC

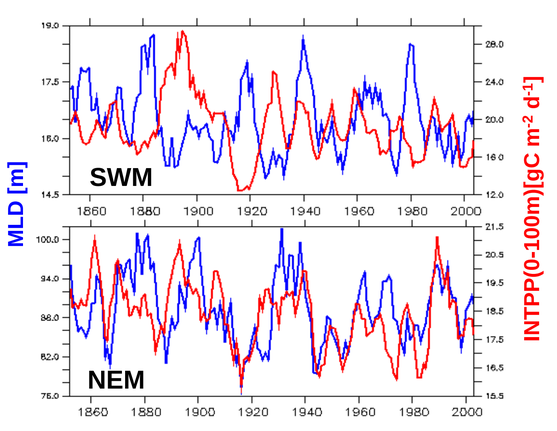
*** Model of Resplandy et al., JGR,2011**

Model analysis

Correlation of various forcings with calcite flux to the sediment from MPI-ESM



Are mixed layer depth and primary production correlated at SO130-275KL?



5-year running means of seasonal values CMIP5 Hist

Summary

Summary and outlook

- **The model system has been implemented for the Arabian Sea and compared to observations of physical and biogeochemical parameters**
- **The model has been spun-up with anthropogenic pCO2 and a run for the NCEP period (1948-2010) has been performed at high resolution**
- **High correlation of MLD and integrated primary production for winter monsoon, low correlation for summer monsoon at SO130-275KL**
- **Some local correlation of calcite flux to the sediment and wind speed off Somalia (summer monsoon) and short wave radiation (winter) in the central Arabian Sea**
- **Next step: derive monsoon index from sediment core and force MPIOM/HAMOCC (limited by severe cut in computing time in 2013)**

Max-Planck-Institut für Meteorologie

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