Some aspects of the biogeochemistry of organic matter in the northern Indian Ocean

Why the Bay of Bengal deserves more attention

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SIBER, 3-6 October 2006, Goa India
Bay of Bengal and Arabian Sea: two twin seas?

- Monsoons: seasonality, reversal of wind fields and ocean circulation,
- closed by Euro-Asian Landmass: restricted deep-water circulation and renewal
Therefore this talk...

.... will concentrate on the BoB

• organic carbon fluxes, composition and provenance

• characteristics of BoB particulate nitrogen isotopic signal

• aims at highlighting some future research needs
Variation of Sea Surface Temperature

convecitive mixing

upwelling

Rixen et al. 1996, GRL
OMZ as result of high productivity and weak ventilation

AS hot spot of denitrification
Fluvial Input

• hampers upwelling and mixing
• source of nutrients (DSi) and particulate matter
• connects BoB to human intervention on the continent

Levitus & Boyer, 1994
Seasonal Flux Pattern

Arabian Sea
Rixen et al. 2000, DSRII

- WAST
- CAST
- EAST

Bay of Bengal

- NBBT-N
- NBBT-S
- CBBT
- SBBT

POC Flux [mg m$^{-2}$ day$^{-1}$]

POC flux [mg m$^{-2}$ d$^{-1}$]

Seasonal Flux Pattern

SW Monsoon
NE Monsoon

May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar Apr
Annual POC Fluxes

AS data from Haake et al. 1993
Influence of Terrestrial Matter?
Organic Matter Express? „scavenging“

Data from Kumar et al. 1998 GRL
Quantification of riverine POC input

- G-B Sediment input:
  \[1000 \times 10^6 \text{ t yr}^{-1}\]
- \(6 \times 10^6 \text{ t POC}\)
- \(2.7 \text{ g POC m}^{-2} \text{ yr}^{-1}\)

AR at trap sites BoB: 0.05-0.14 g POC m\(^{-2}\) yr\(^{-1}\)

AS: 0.6-0.13 g POC m\(^{-2}\) yr\(^{-1}\)
Bengal Fan Organic Matter

Freeman & Colarusso, 2001 GCA
Quality of OM input

Map: Nov/Dec 1997
- chl a mg/m³

Graph:
- SPM mg/L
- AA-C%
- mg/L
- POC%
- AA-C%

Axes:
- Y-axis: 0, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100
- X-axis: AucourPZ55, PZ53, PZ6, PZ10
Terrestrial signal in sinking matter?

Aucour et al
Reloading of Particles with Marine Organic Matter?

![Graph showing the contribution of estuarine (PZ55) AA and CHO to total AA and CHO for different samples: planktonic suspension, NBBT-N dp, KL 126 0-1 cm, KL 120 0-1 cm, and NBBT-N surface sediments.](image)
Quality of organic matter

![Graph showing quality of organic matter](graph.png)
Nitrogen Isotopes

$\delta^{15}N$ in sinking particles

...another good reason to go to the Bay

(Kumar et al. 2005)

Seasonal distribution of $\delta^{15}$N in sinking particulate matter
Unger et al. in press, DSR
Research needs

• particulate organic matter especially in sediments of the Bay of Bengal has to be characterized in order to trace pathways and quantify terrestrial organic material with respect to its role in the regional and global carbon budget

• more research has to be done on nitrogen isotopic composition of riverine and marine nitrate and DON and particulate organic matter in the Bay including investigation of the role of nitrogen fixation