

Solid-phase extraction of dissolved organic matter (SPE-DOM) from river, estuarine and open ocean waters

Gerhard Kattner¹, Thorsten Dittmar², Boris Koch¹, and Norbert Hertkorn³

¹Alfred Wegener Institute for Polar and Marine Research, Ecological Chemistry, Bremerhaven, Germany

²Florida State University, Department of Oceanography, Tallahassee, USA

³GSF-National Research Centre for Environment and Health, Institute of Ecological Chemistry,
Neuherberg, Germany

Extraction methods

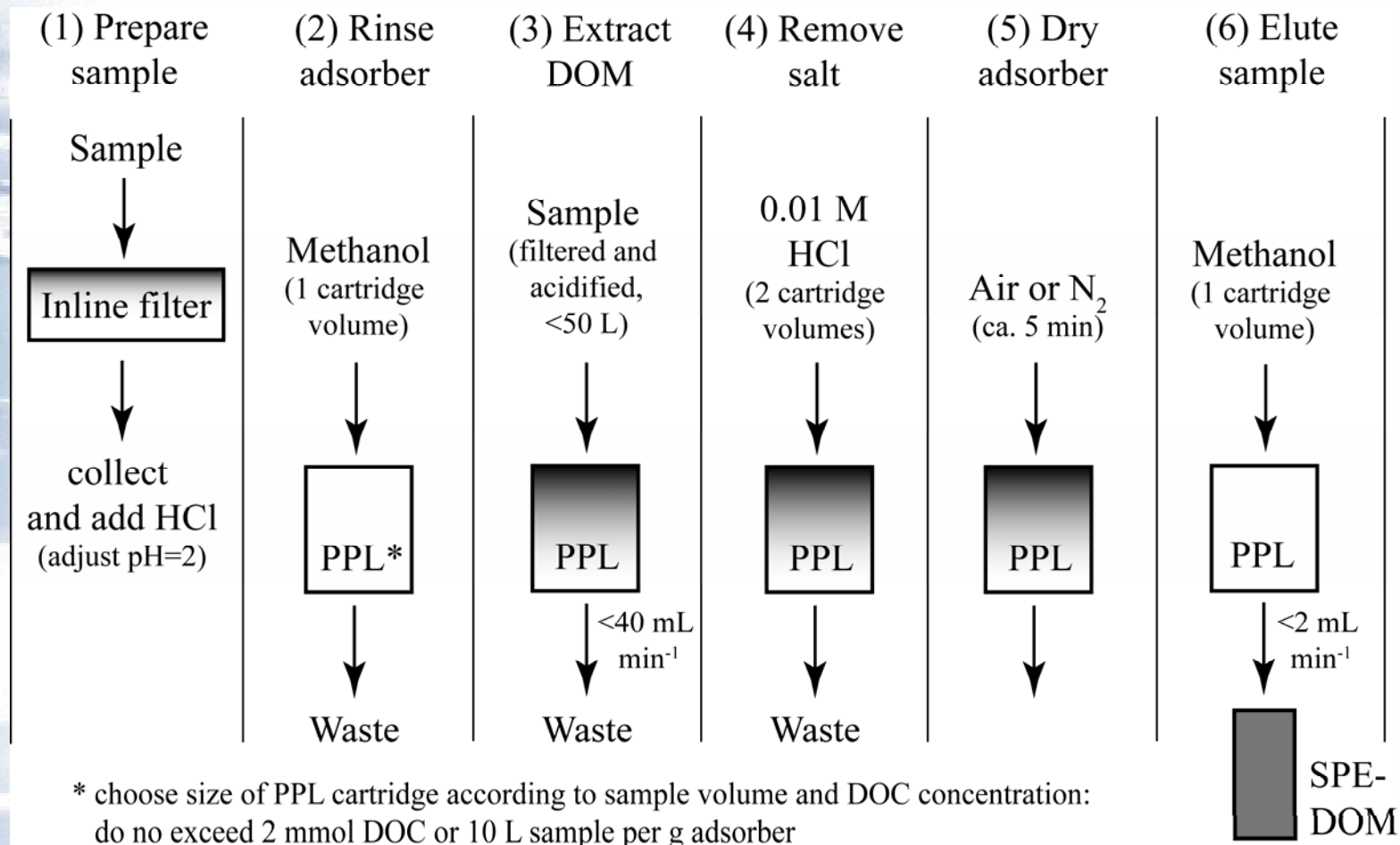
- Solid-phase extraction (SPE)
 - using XAD resins
 - using sequential combination of different XAD resins
 - using various sorbents
 - using pre-packed cartridges and discs with silica-C18 sorbent
- Ultrafiltration with a 1 kDa cutoff
- Combination of ultrafiltration and SPE
- Sequential combination of reversed osmosis and electrodialysis

Properties of the solid phase sorbents

(according to manufacturer's (Varian) information)

Sorbent	Structure	Pore size	Retention properties
C18	octadecyl bonded phase, silica-based	60 Å	retention of non-polar compounds
C18EWP	octadecyl bonded phase, silica-based	500 Å	more efficient retention of large molecules, compared to C18
C18OH	non-encapped octadecyl bonded phase, silica-based, with active silanol groups	150 Å	enhanced retention of basic compounds, compared to C18
C8	octyl bonded phase, silica-based	60 Å	not as retentive for non-polar compounds as C18
PPL	styrene divinyl benzene polymer	150 Å	retention of highly polar to non-polar substances from large volumes of water
ENV	styrene divinyl benzene polymer	450 Å	similar to PPL, larger pore size

Scheme for the isolation of SPE-DOM from seawater



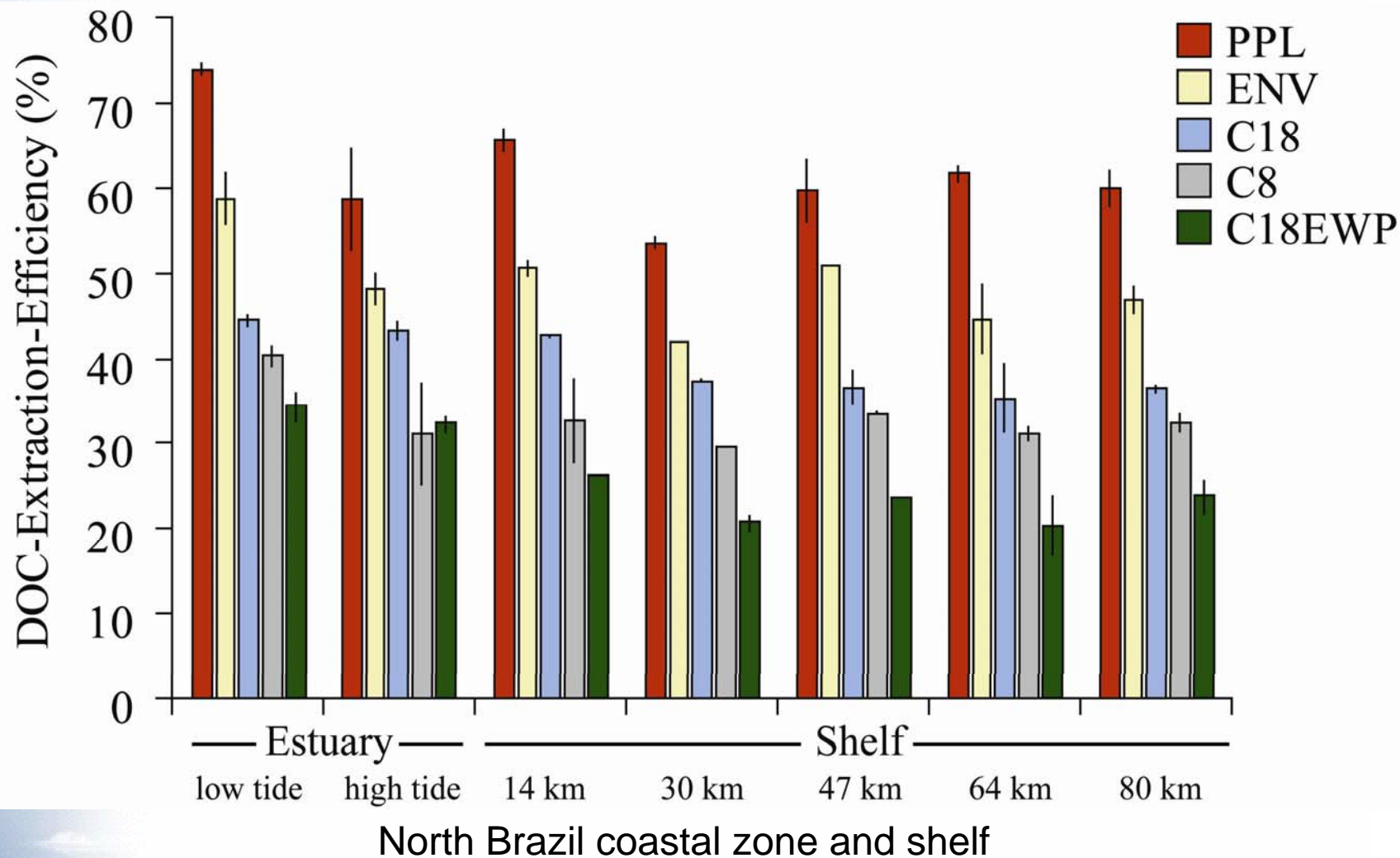
Extraction procedure aboard



PPL-Extracts

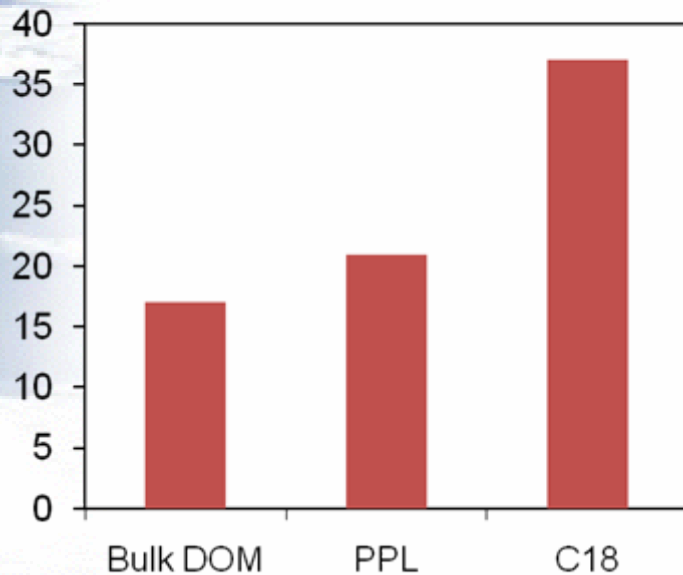


Extraction efficiencies for the isolation of SPE-DOM using different sorbents

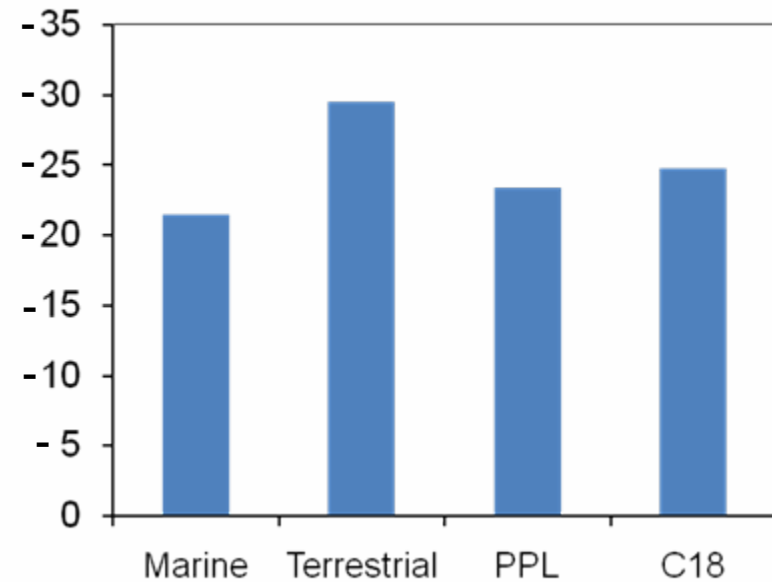


North Brazil shelf and coastal zone

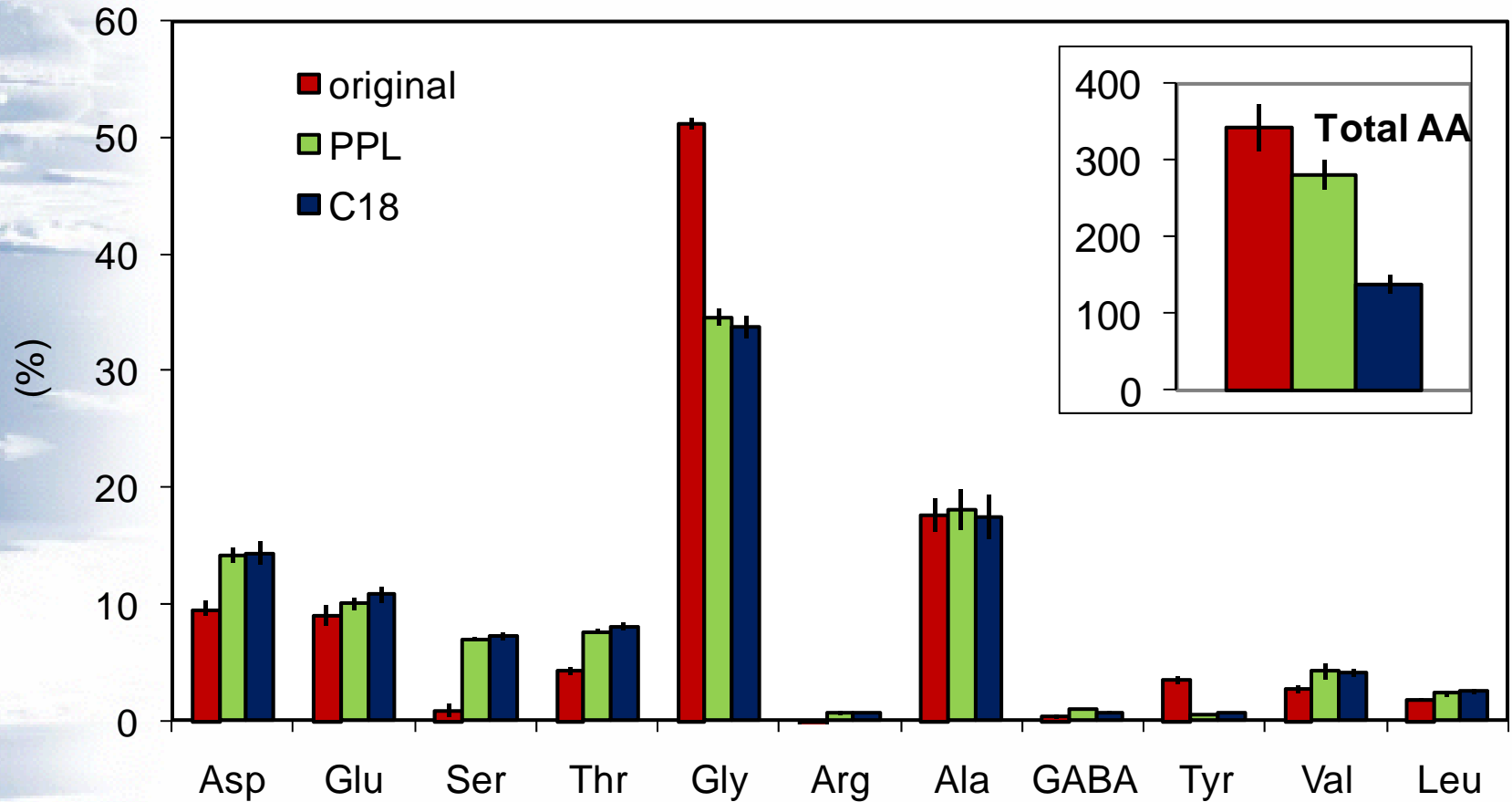
C/N ratio



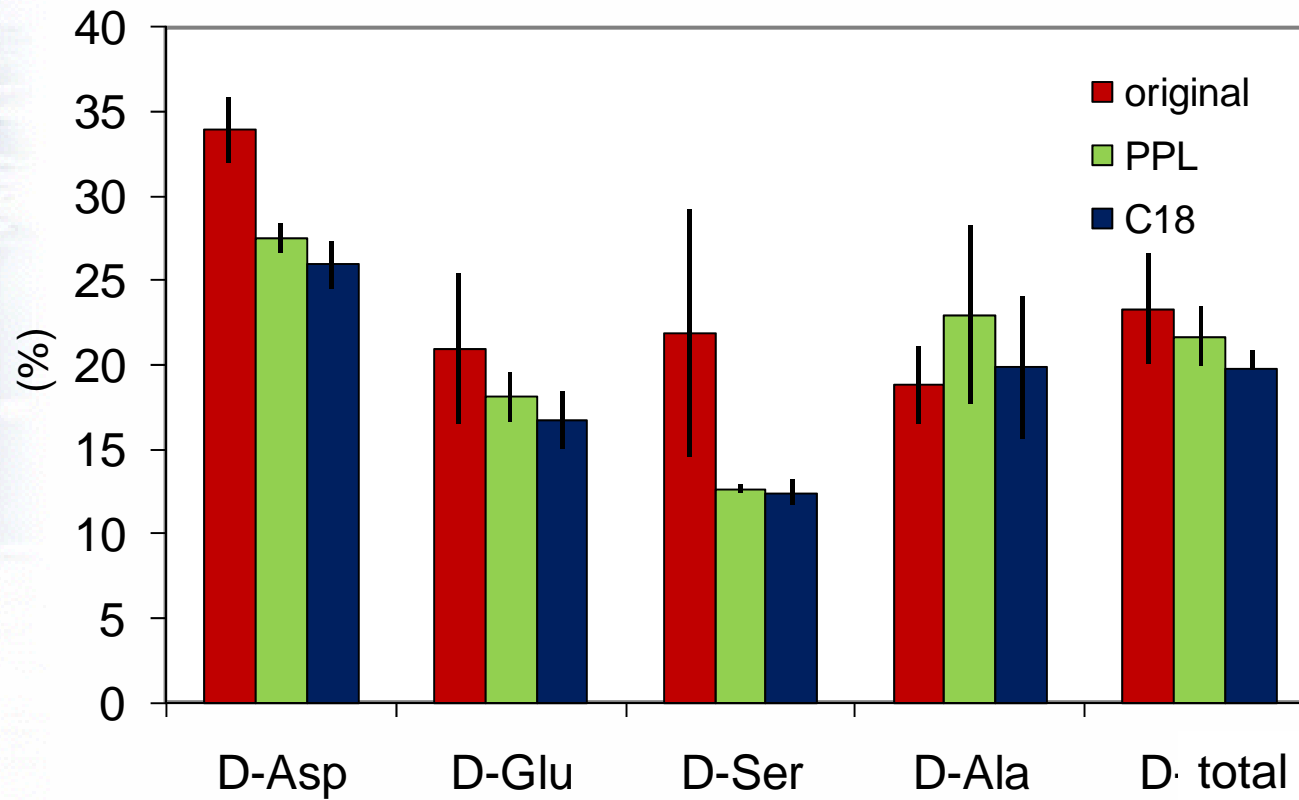
delta ¹³C



Composition of combined hydrolysable amino acids (North Sea)



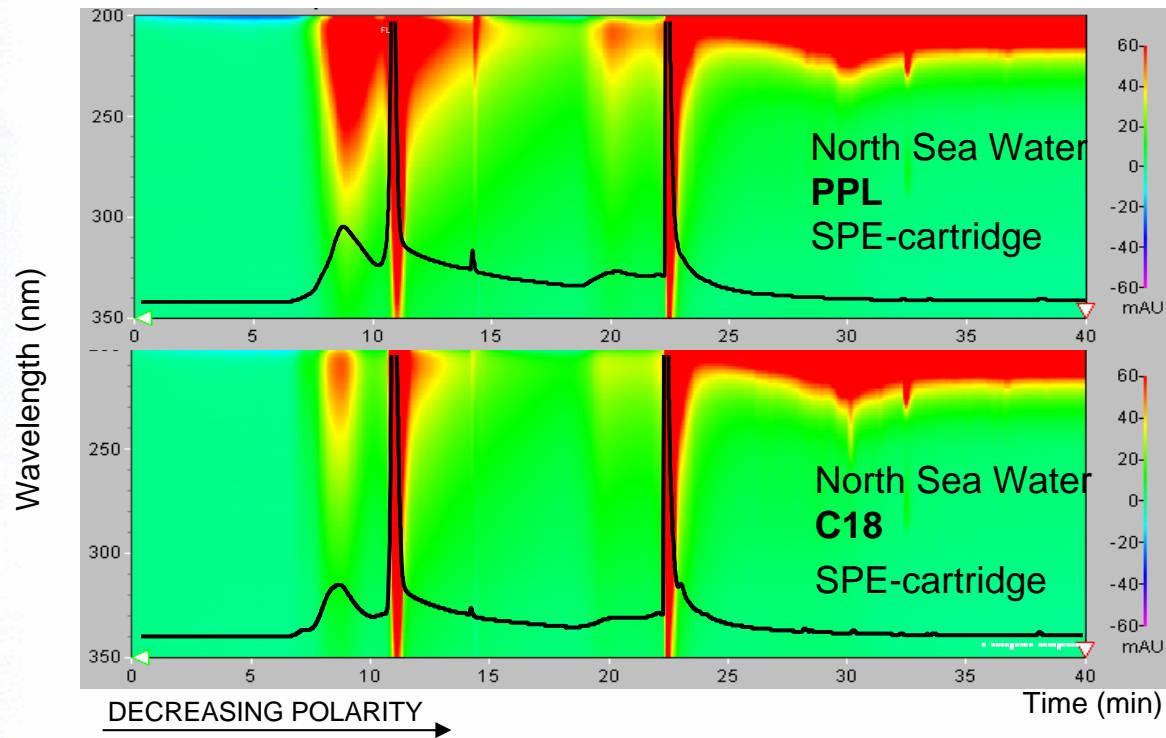
Percentage of D-amino acids (North Sea)



Reversed-Phase High-Performance Liquid Chromatography (HPLC)

Comparison of PPL and C18 sorbent

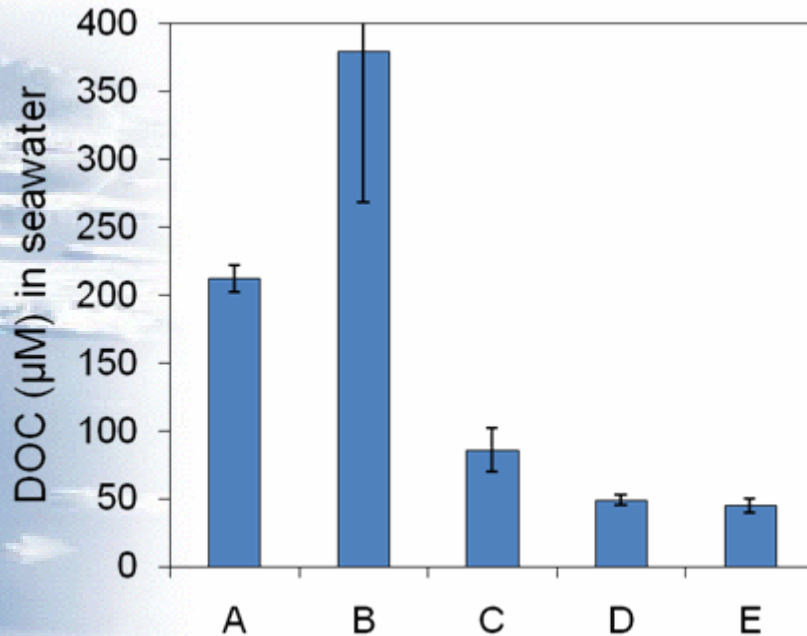
Fluorescence and DAD detection



Fluorescence detector:
ex: 260 nm; em: 430 nm
DAD contour plot : 200-400 nm
(700 nm)

All other parameters are identical, e.g.
amount of enriched sample, elution
volume, injection volume

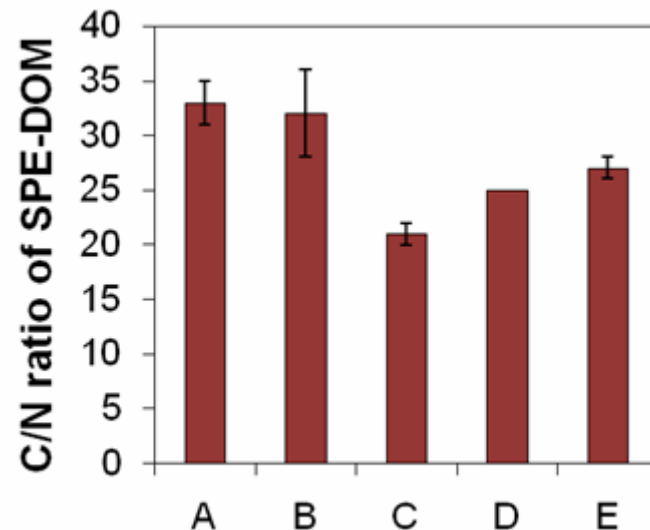
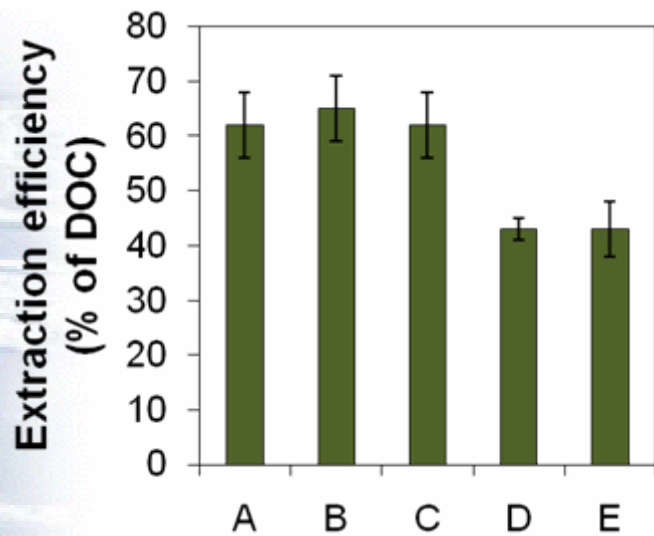
Location of samples and DOC concentration



- A Apalachicola River and tributaries
- B Apalachicola salt marshes
- C North Brazil shelf and coastal zone
- D Gulf of Mexico deep sea
- E Weddell Sea (surface to bottom)



Extraction efficiency and C/N ratio of SPE-DOM (PPL)



- A Apalachicola River and tributaries
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Summary

Simple and robust method

PPL extracts >60% of coastal and >40% of deep-sea DOC

PPL retains a major fraction of N-containing compounds

Complete desalting of the sample

NMR

Ultra high resolution MS

Various HPLC- and GC-MS-MS methods

Fractionation of samples

Autonomous extraction with pumps from ship or on moorings



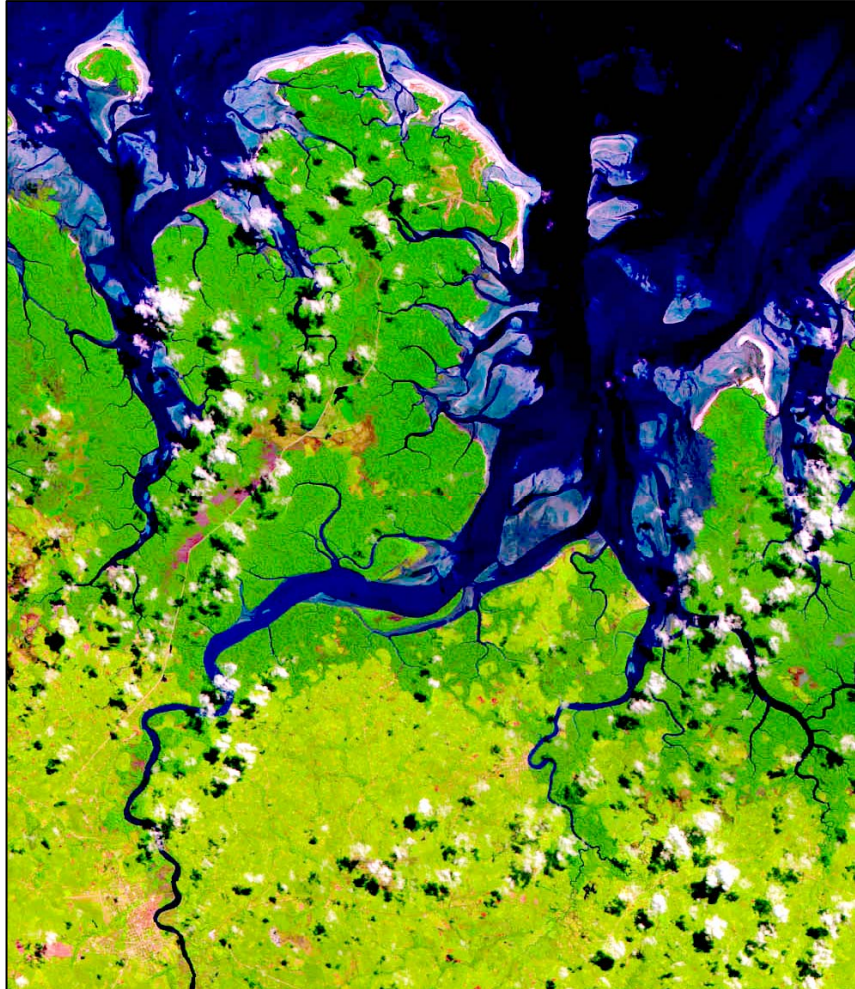




**I urgently propose
a workshop
to decide on extraction methods for DOM**

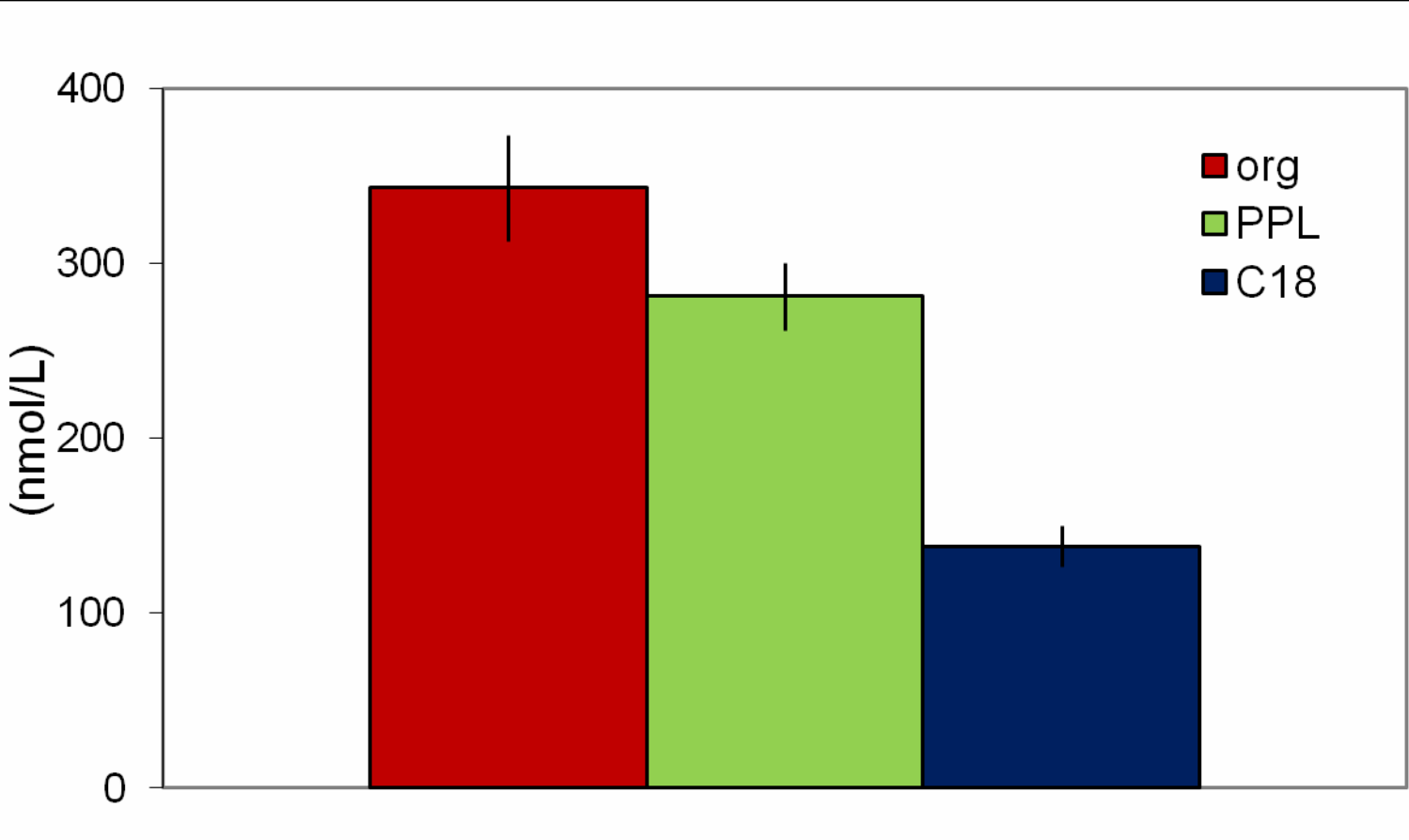
Thank you

Caeté Estuary (Brazil)

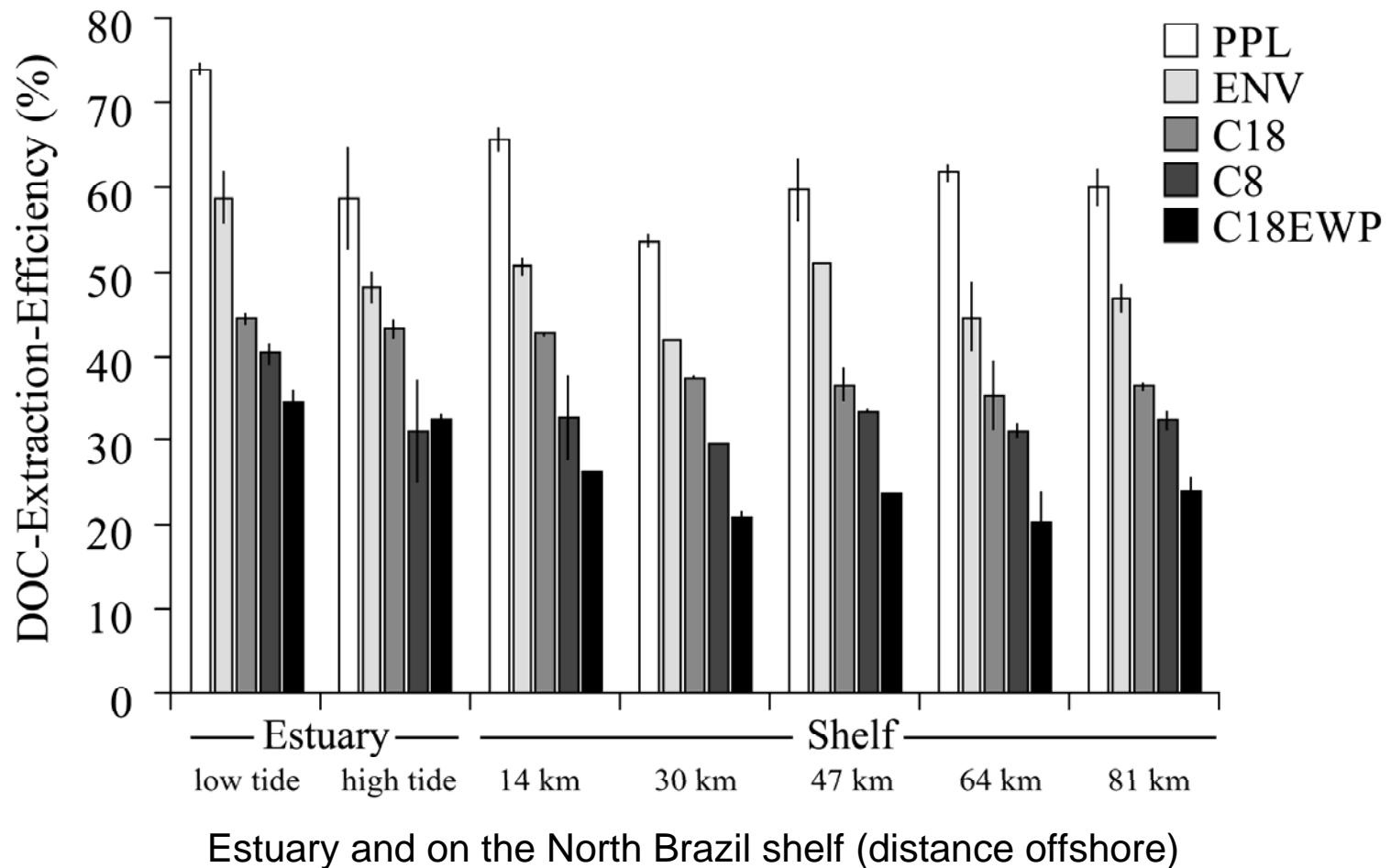




Concentration of total amino acids



Extraction efficiencies for the isolation of SPE-DOM using different sorbents





Concentration of amino acids

