Nutrient Dynamics in the Ocean

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Lab Review 2008

AOML nutrient program
Contribution to NOAA's mission

Ocean and Climate

Water mass tracer in ocean circulation

Quantifying oceanic uptake of CO_2

Ecosystem

Source and transport of nutrient

Cycling of nutrient within ecosystem

(e.g., sediment/water)

Outline

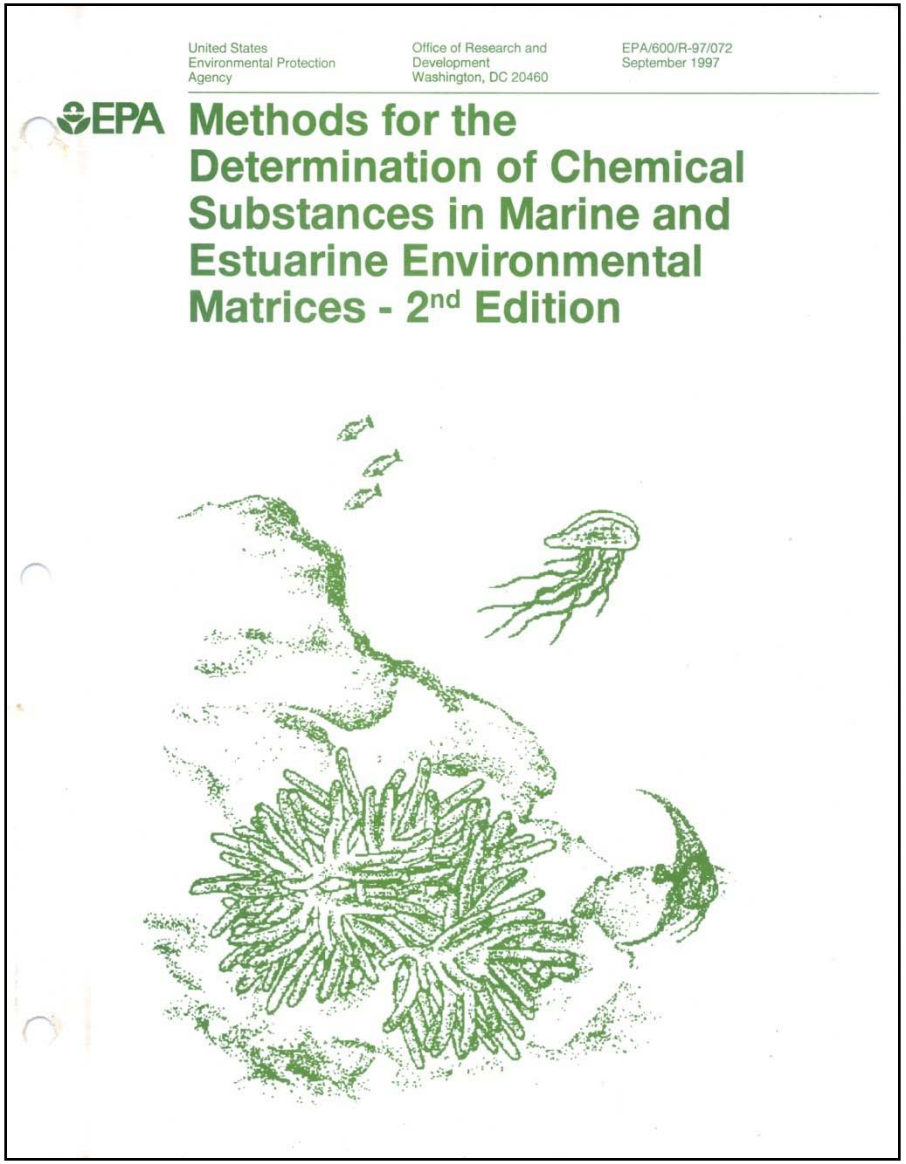
Cutting Edge technology development

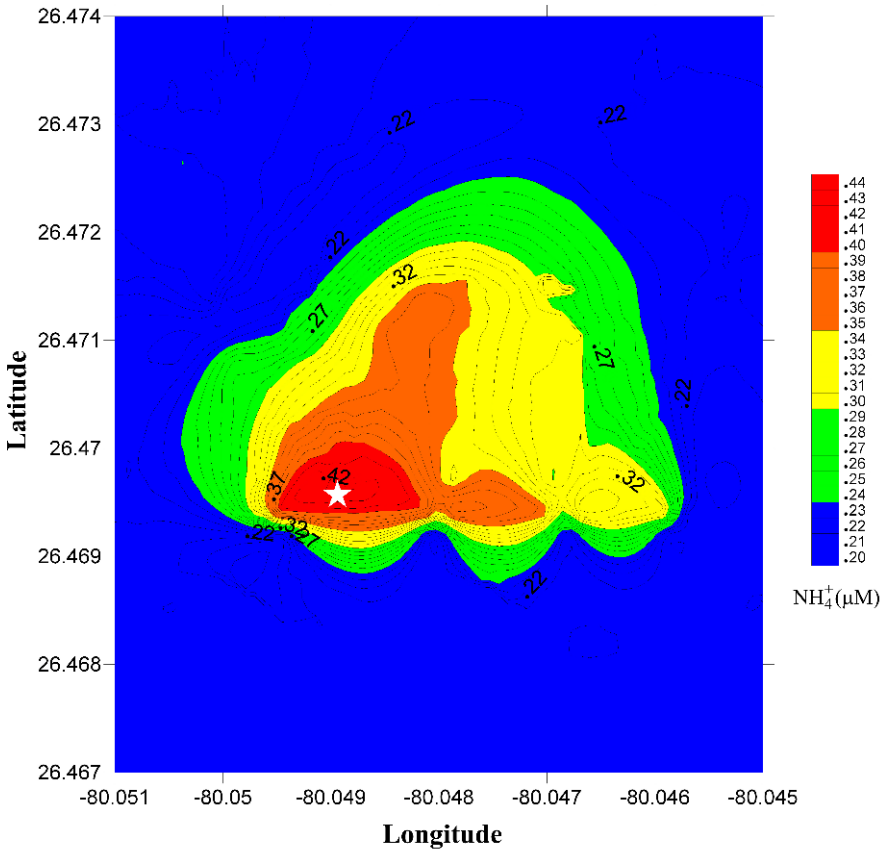
- EPA standard methods
- Underway instrumentation
- Liquid waveguide

Preeminent Research

- Phosphorus cycle in Florida
- Nutrient input ot coastal water
- Repeat Hydrography

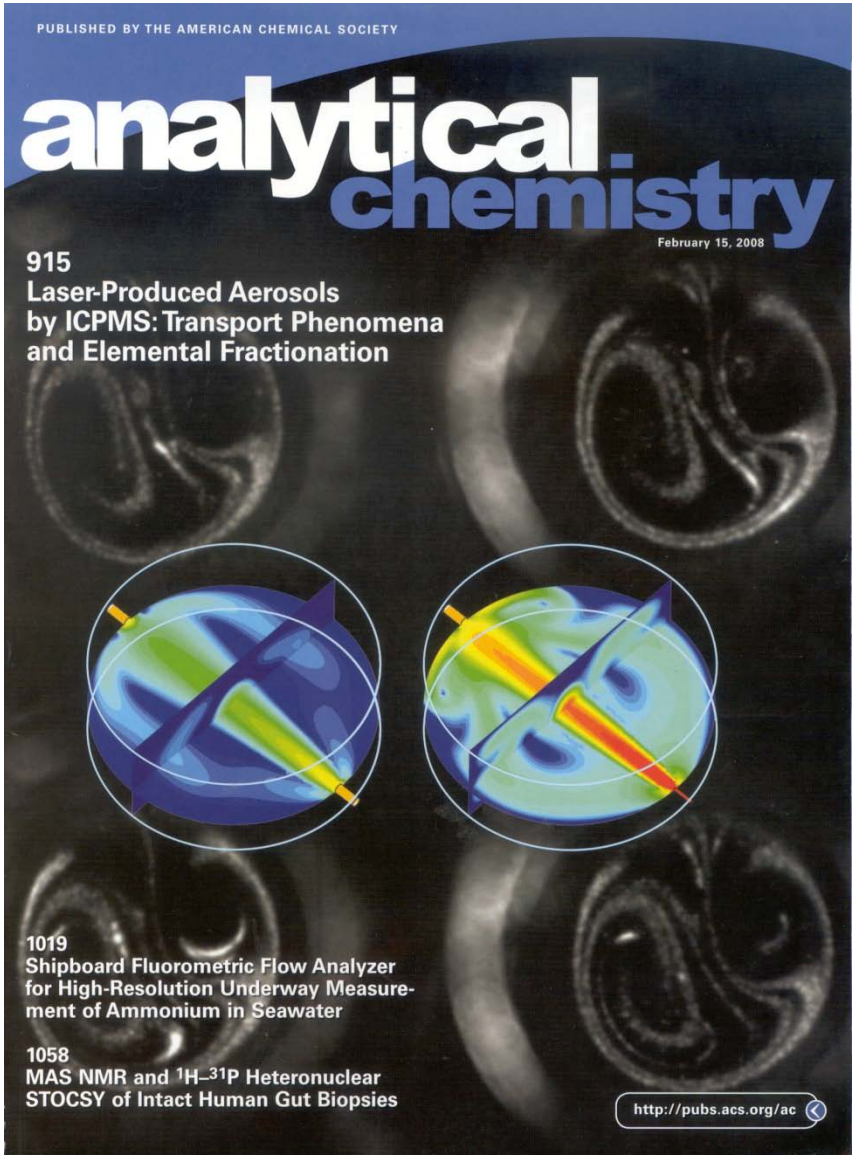
- nitrate/nitrite
- ammonium
- silicate
- total N
- total P



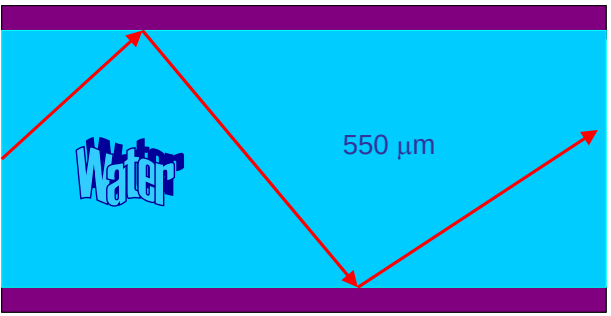


Mapping ammonia dispersion in an oceanic outfall

Amomthammarong & Zhang 2008

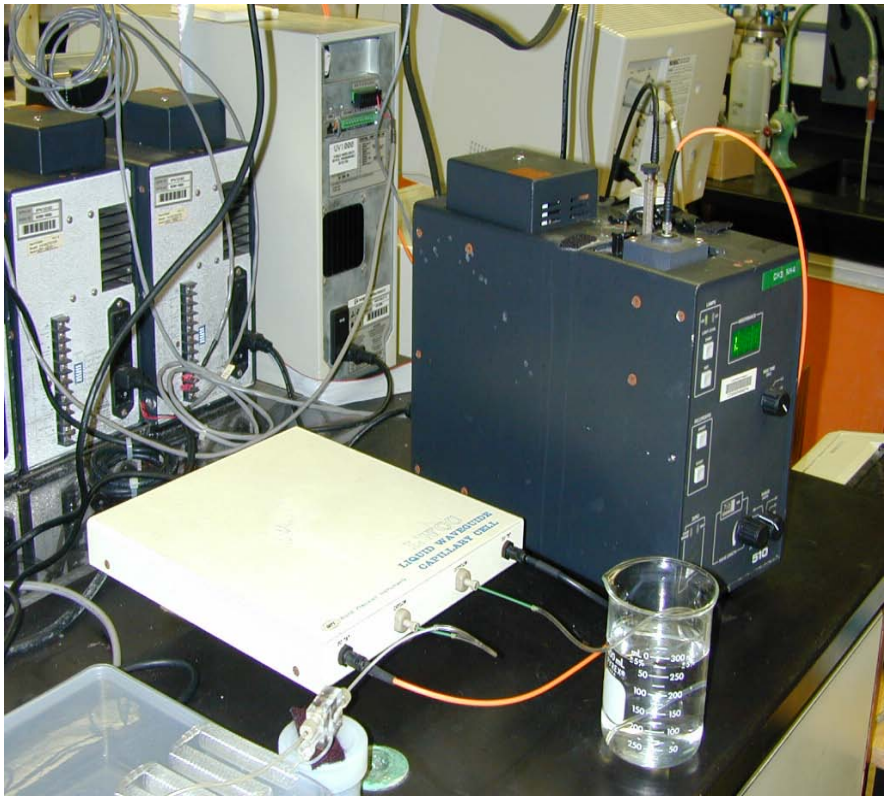


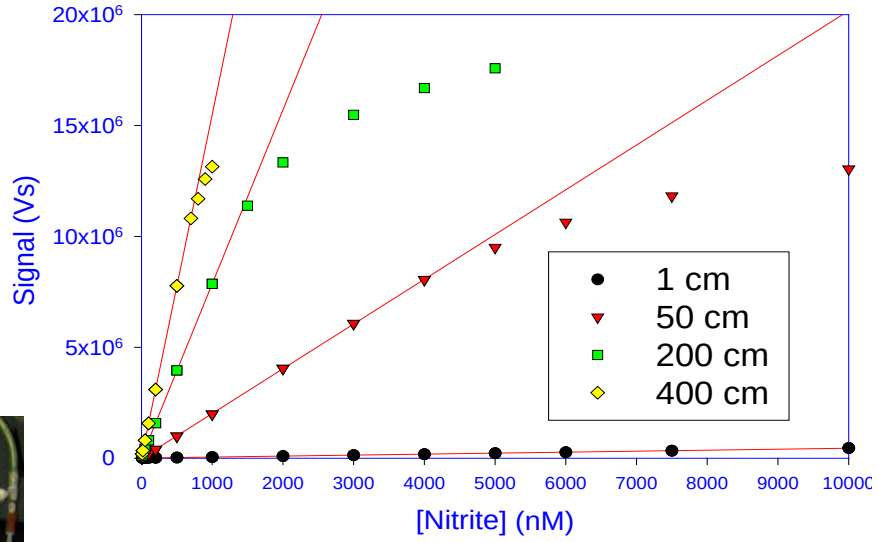
Sensitivity Enhancement by Liquid Waveguide

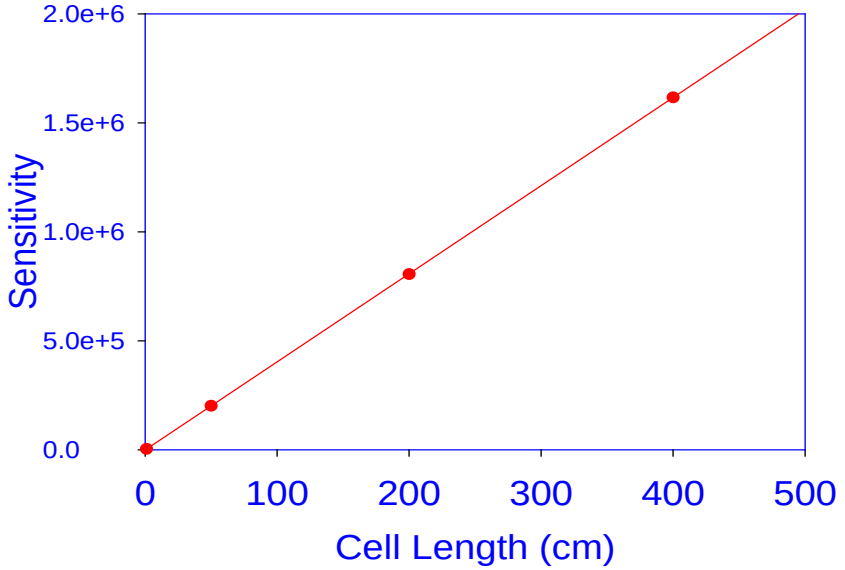


n_{teflon} =1.31

n_{water} =1.33



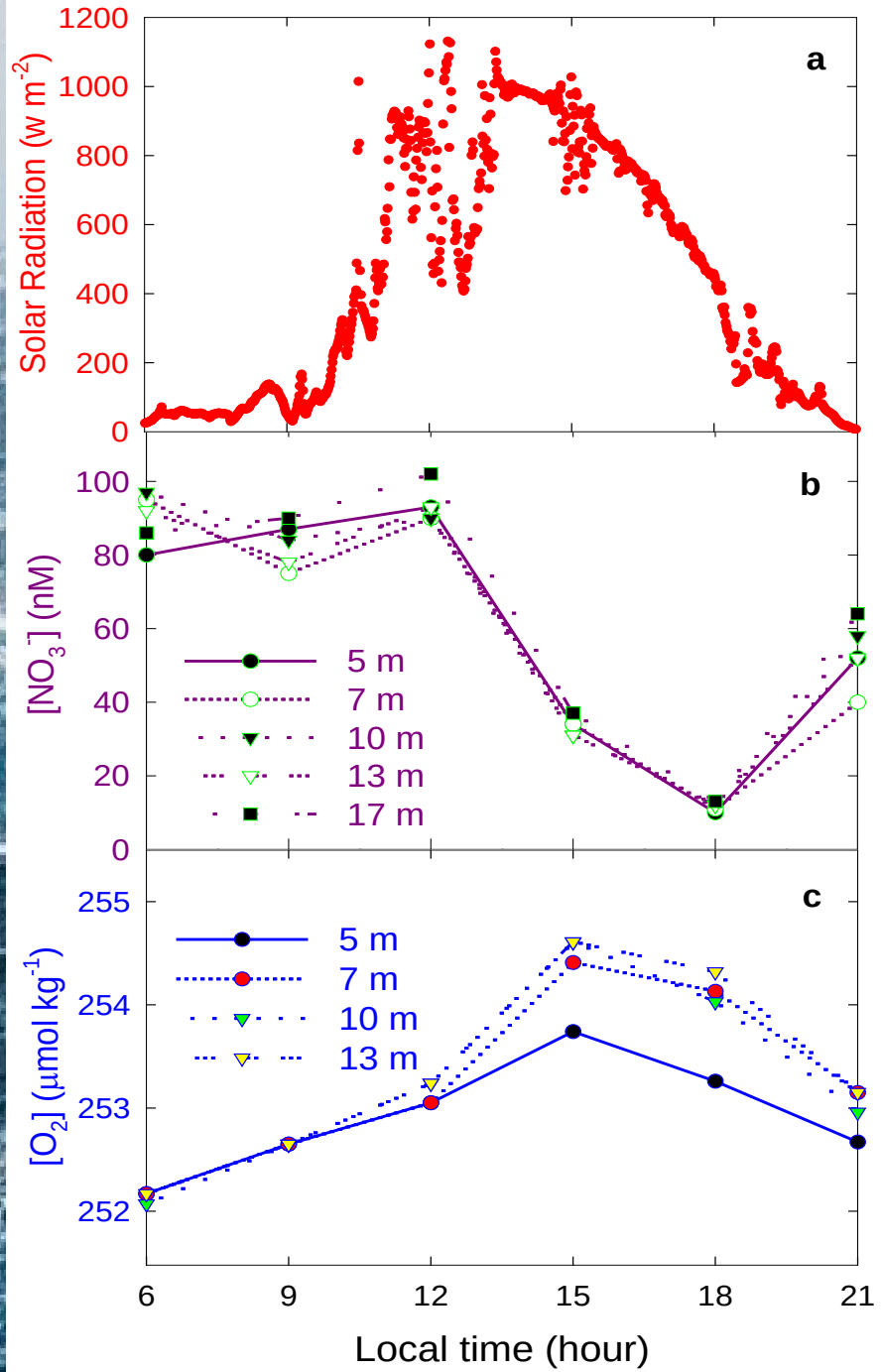




Zhang 2006 Analytical Science

Oceanic photosynthsis observed from diel cycle of nitrate at nM levels

Zhang et al,
GRL 2001



Parameters essential to model sediment/water exchange of phosphate

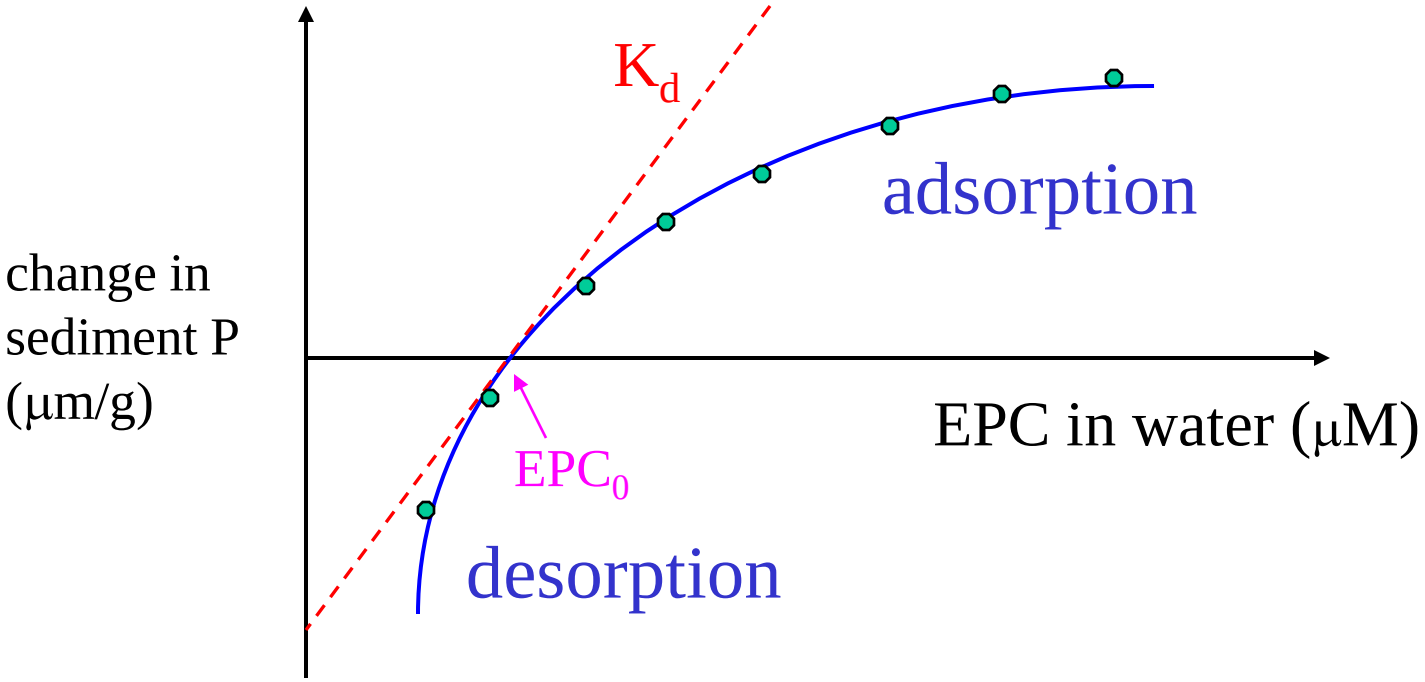
1. Distribution coefficient

$$K_d = P_{sediment} / P_{water}$$

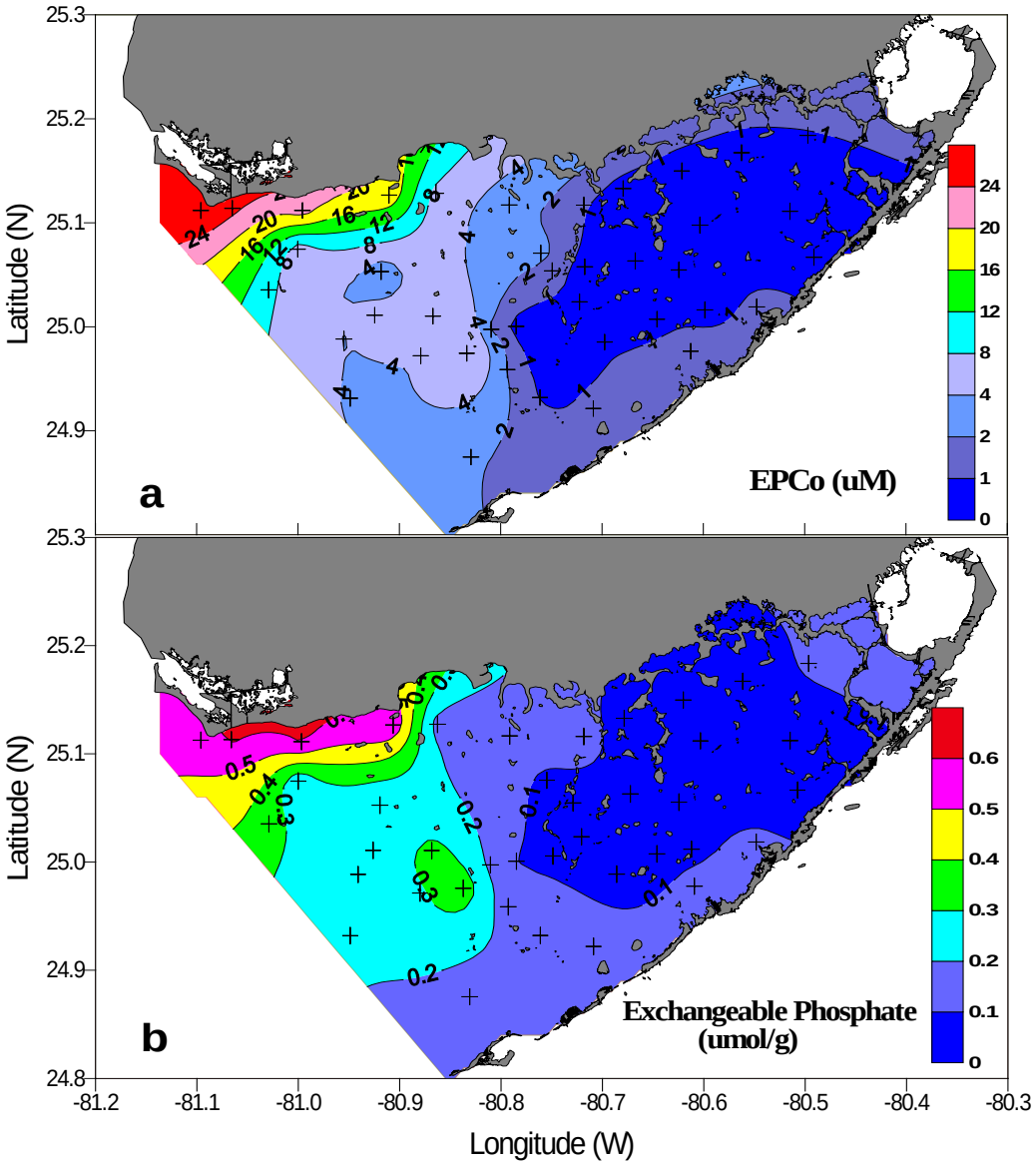
2. Zero Equilibrium Phosphate Concentration (EPC_0)

   water P concentration at which no exchange of P between sediment and water

Sorption experiments to quantify K_d and EPC_0



Spatial distribution of EPC_0 and P_{exch} in Florida Bay

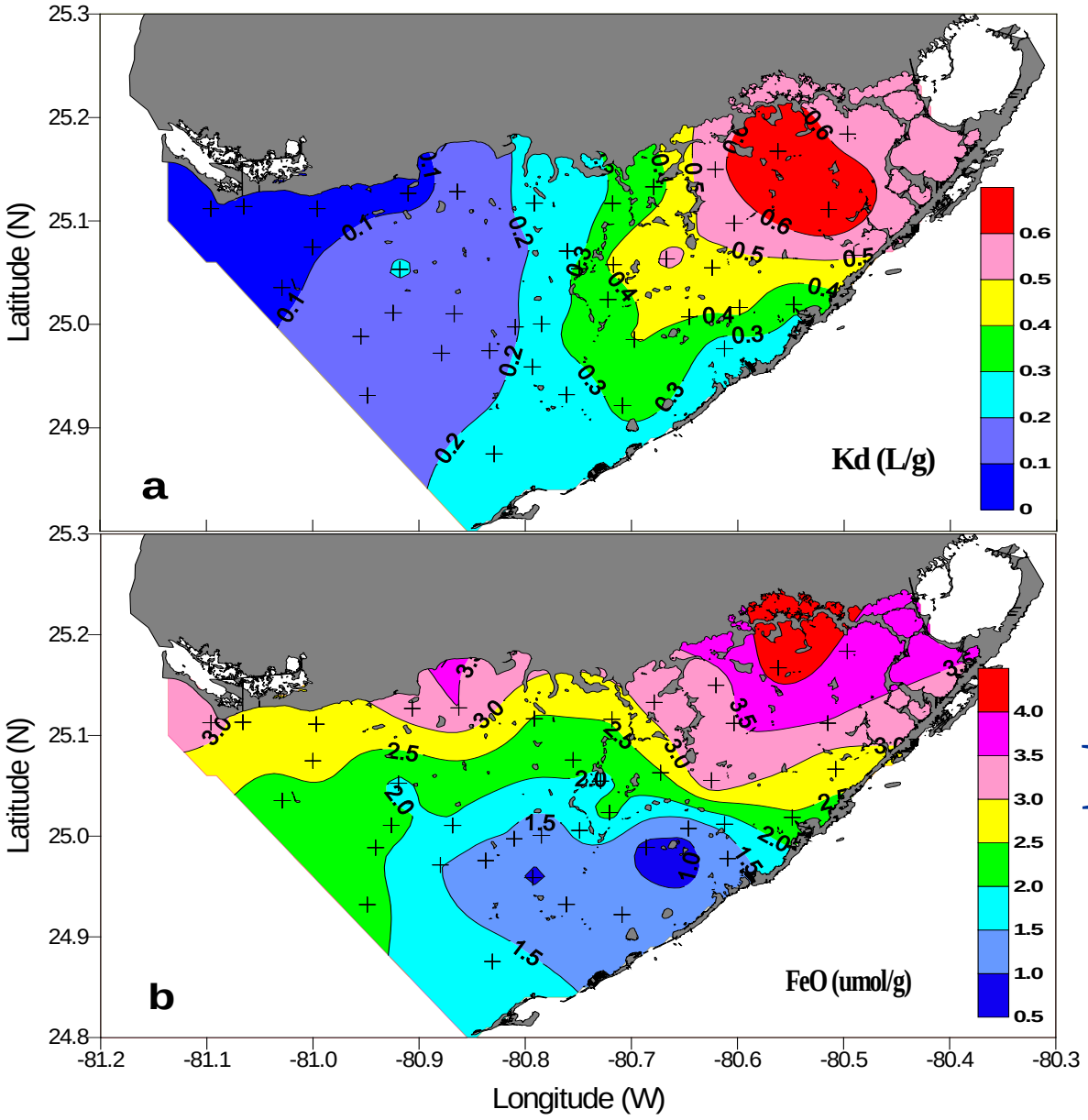


EPC_0

P_{exch}

Zhang &Huang, ES&T 2007

Spatial distribution of K_d and Fe in Florida Bay

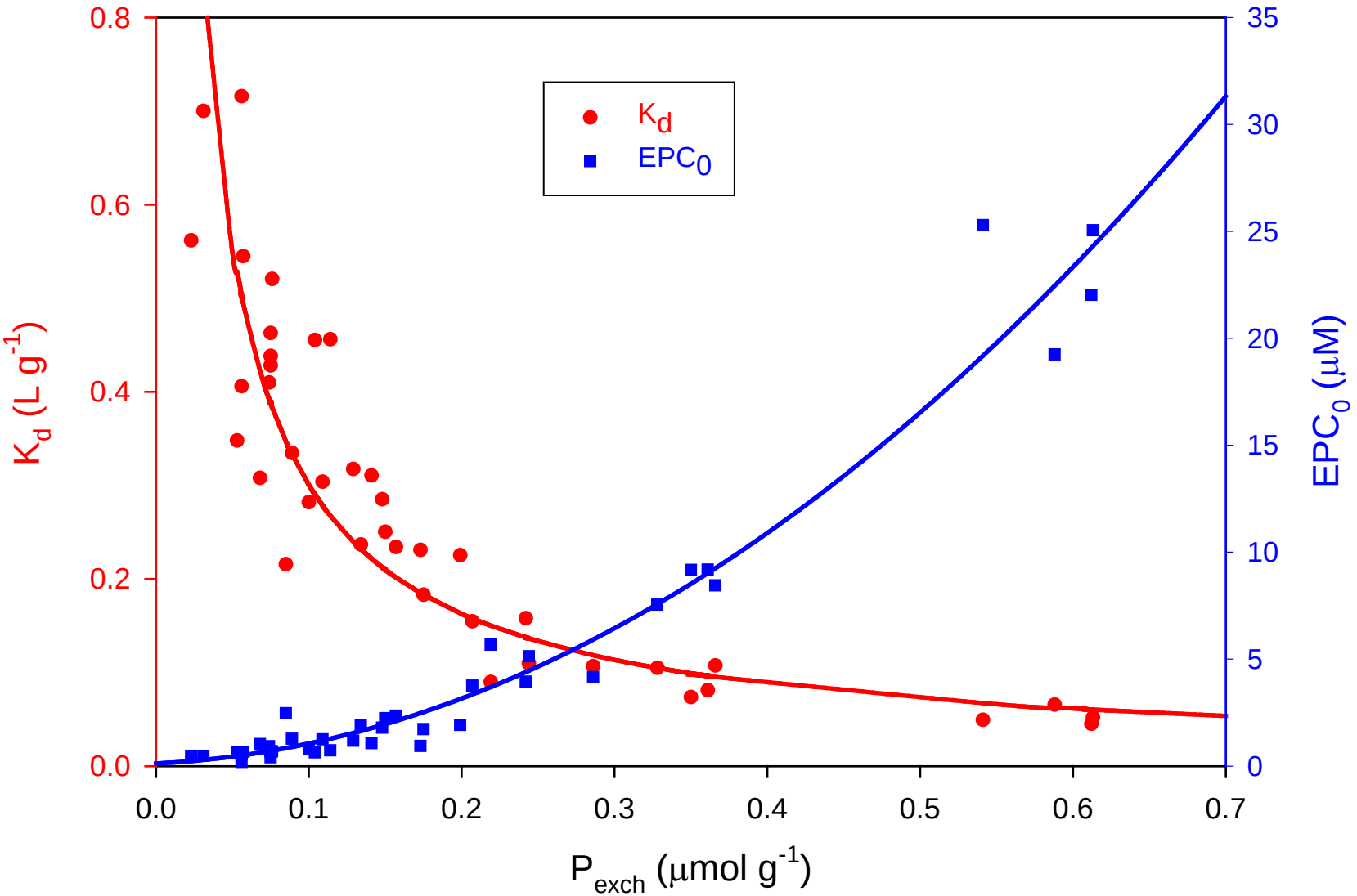


K_d

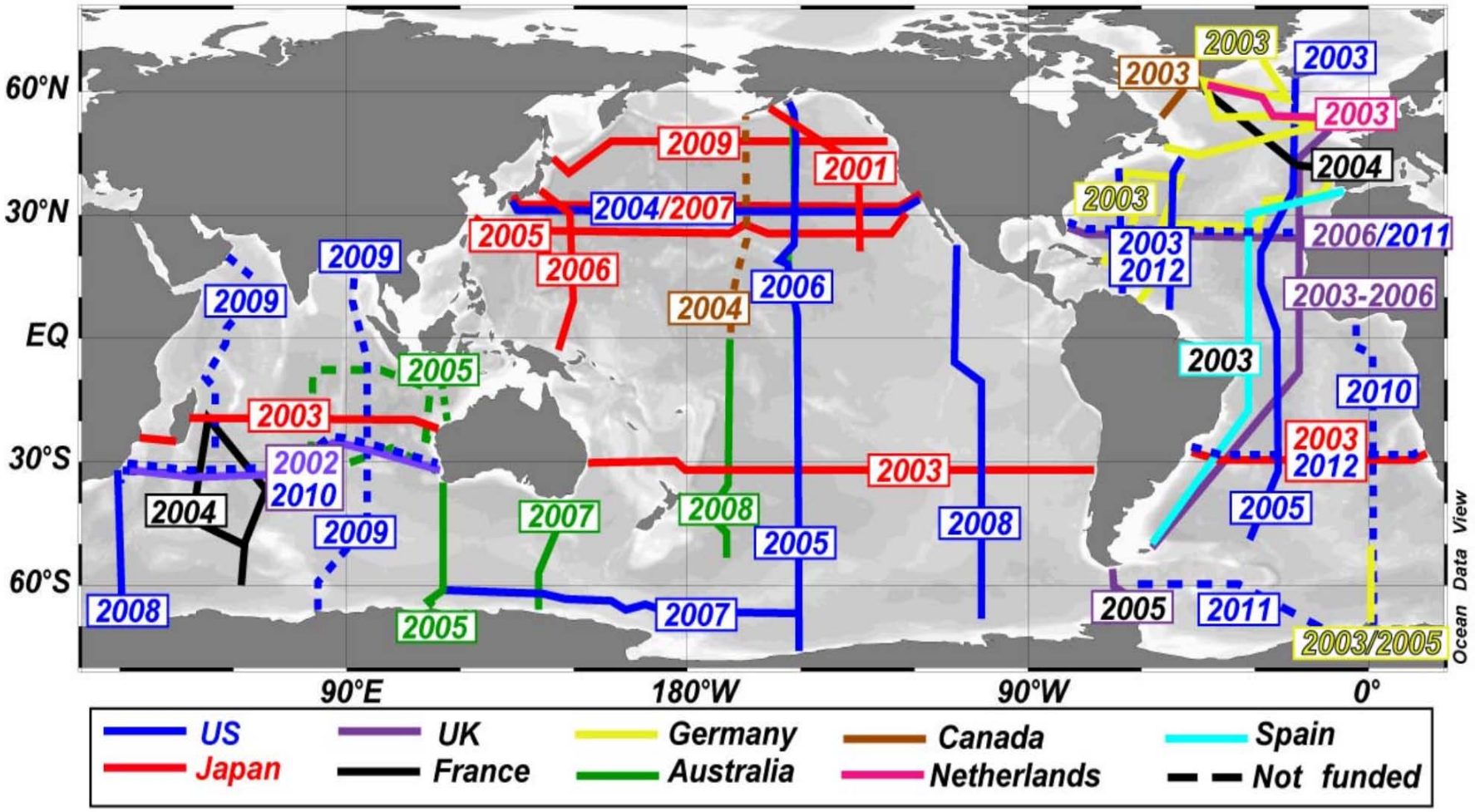
Fe

EPC_0 and K_d as a function of P_{exch} in Florida Bay

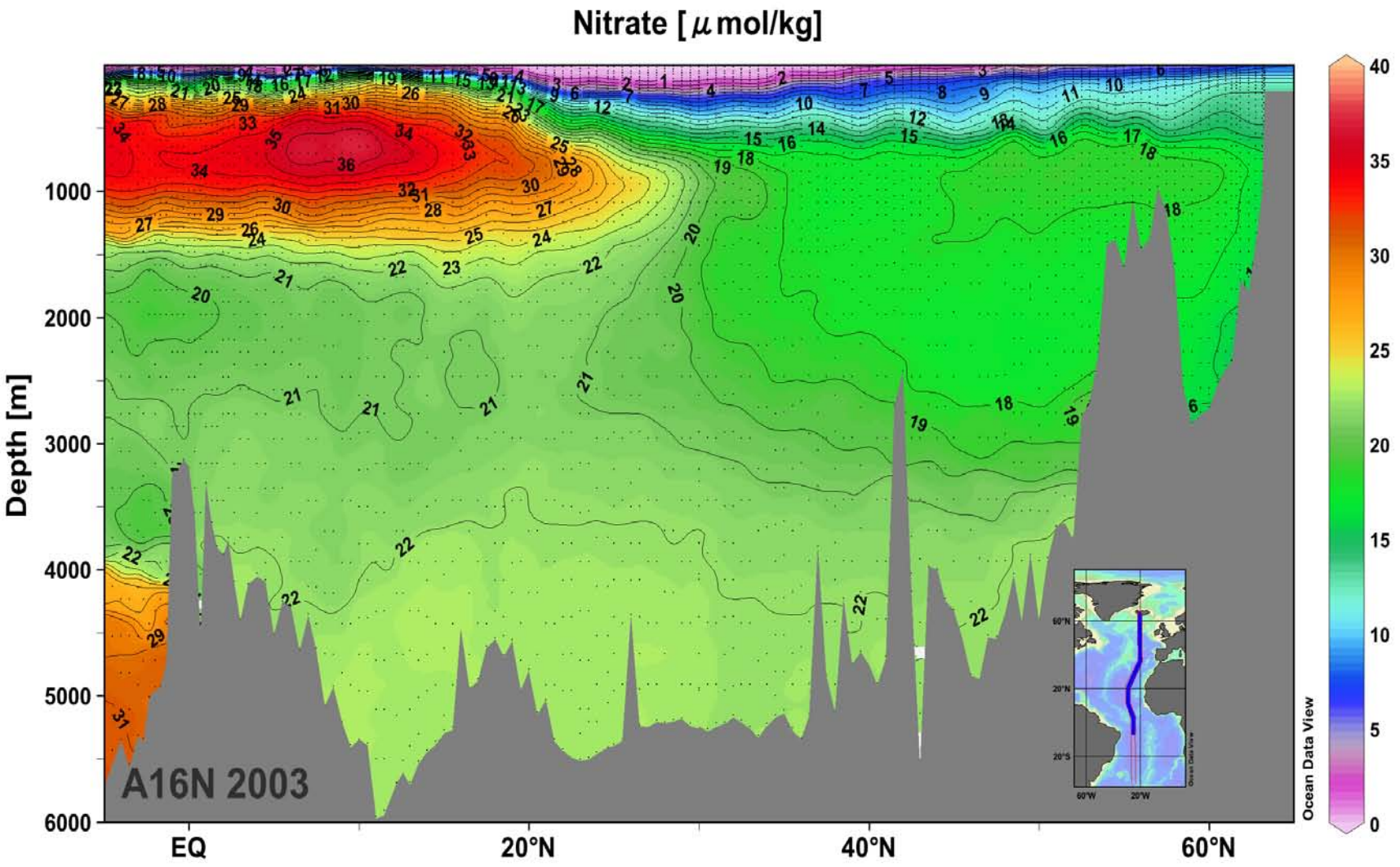
Zhang &Huang, ES&T 2007



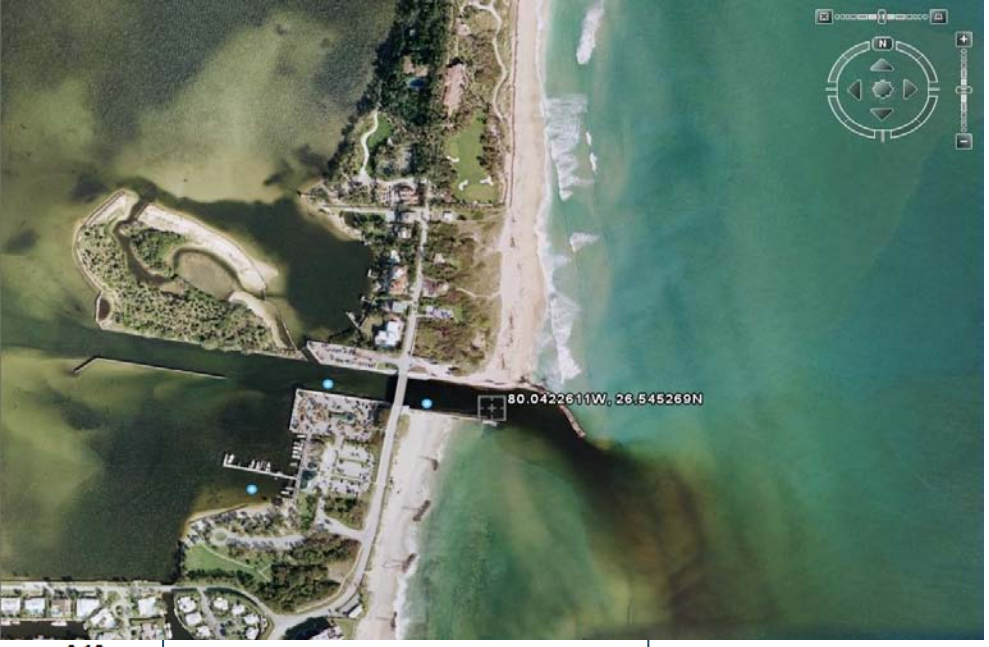
Repeat Hydrography CO_2/tracer Program hydrographic sections

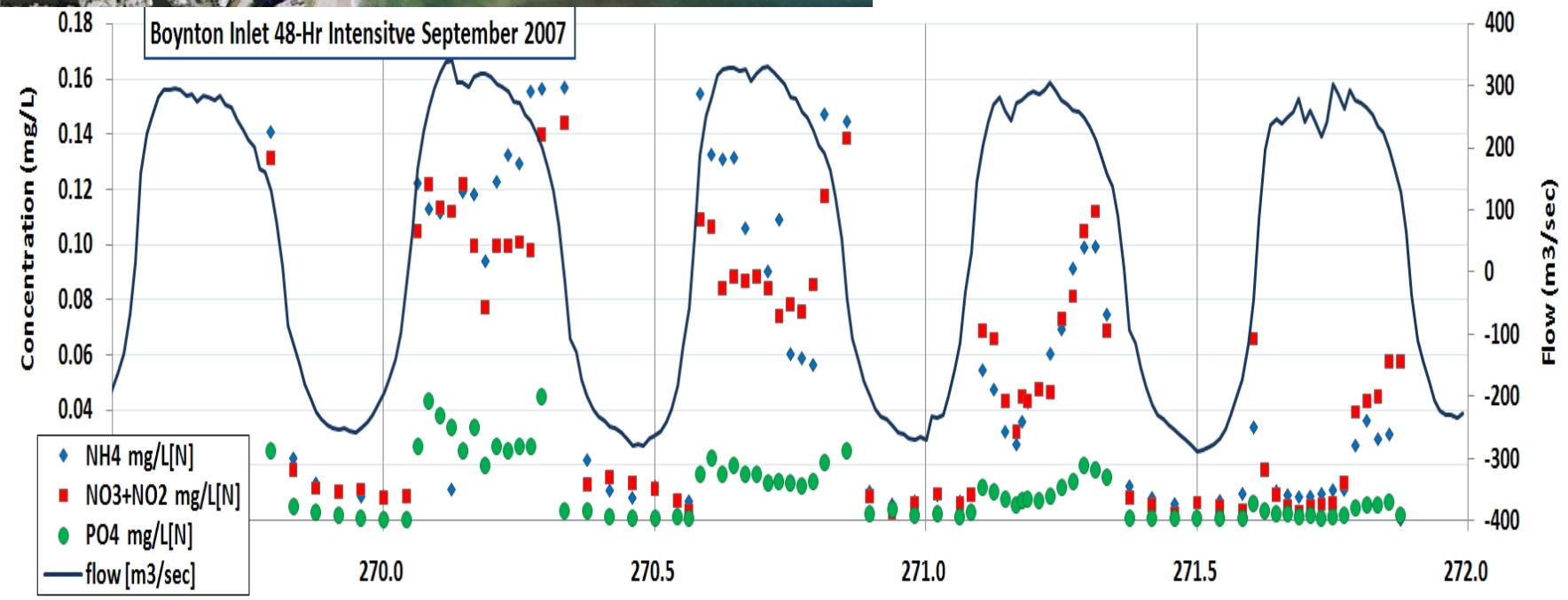


Nitrate in North Atlantic



Tide induced nutrient flux to coastal waters





Outlook & challenges

Nutrient Dynamics/Ecosystem Functioning

- Shipboard underway measurement for oligotrophic ecosystem
- In situ nutrient sensors for time-series monitoring(e.g. coral reefs)
- Developing Certified Reference Materials (CRM) to Improve accuracy