Oxygen Productivity: Florida COOS Caucus

April 3, 2006

In situ O_2 Productivity in 'Functional Genomics of a Subtropical Harmful Algal Bloom Species: *Karenia brevis* Davis'.

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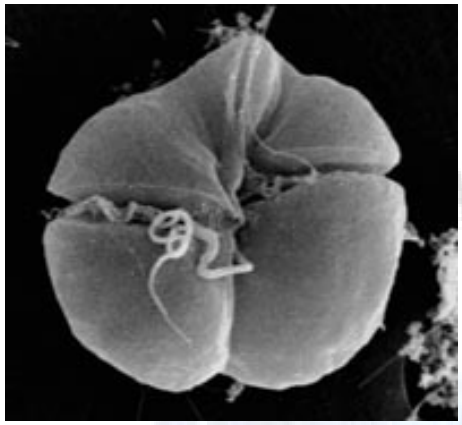
Collaborators: Chris Langdon, Larry Brand, Chris Siniginiallo

Field Component in support of functional genomics:

- Seasonal *Karenia brevis* studies of carbon cycling at Sarasota Bay (Mote Marine Laboratory)

- Field observations to interpret carbon fluxes, and provide basis for functional genomics results

- Bi- or tri-monthly carbon fluxes 2005-2008. In situ oxygen production



Carbon metabolism in *Karenia brevis* in natural and cultured populations:

Carbon fixation (photosynthesis):

Productivity: Vargo et al. (1987), Bendis et al. (2004)

P-I response: Schaeffer et al. (2004)

Photoadaptation: Evens et al. (2001)

Pigments: Millie et al. (1995)

Why be concerned about community respiration?

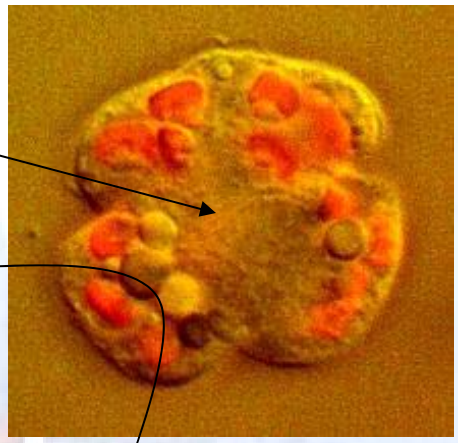
- High r_d:P_{max} rates: Diatoms 0.14 Chlorophytes: 0.11
  Cyanobacteria 0.07 Dinoflagellates: 0.35
  (Geider and Osborne, 1989)
- I_{comp} also high (Langdon, 1987):
  Diatom, Chrysophyte: 1-10 µEinst m^{-2} s^{-1}
  Gonyaulax tamarensis: 35 µEinst m^{-2} s^{-1}
- N assimilation linked to respiration (Turpin et al., 1990).

Production & Respiration Rates in Natural Populations:
Carbon, Oxygen, Optical properties, Molecular probes

Tracers:

- $H^{14}CO_3$
(POC; excretion)

- $H_2{}^{18}O$
gross
Grande (1988)

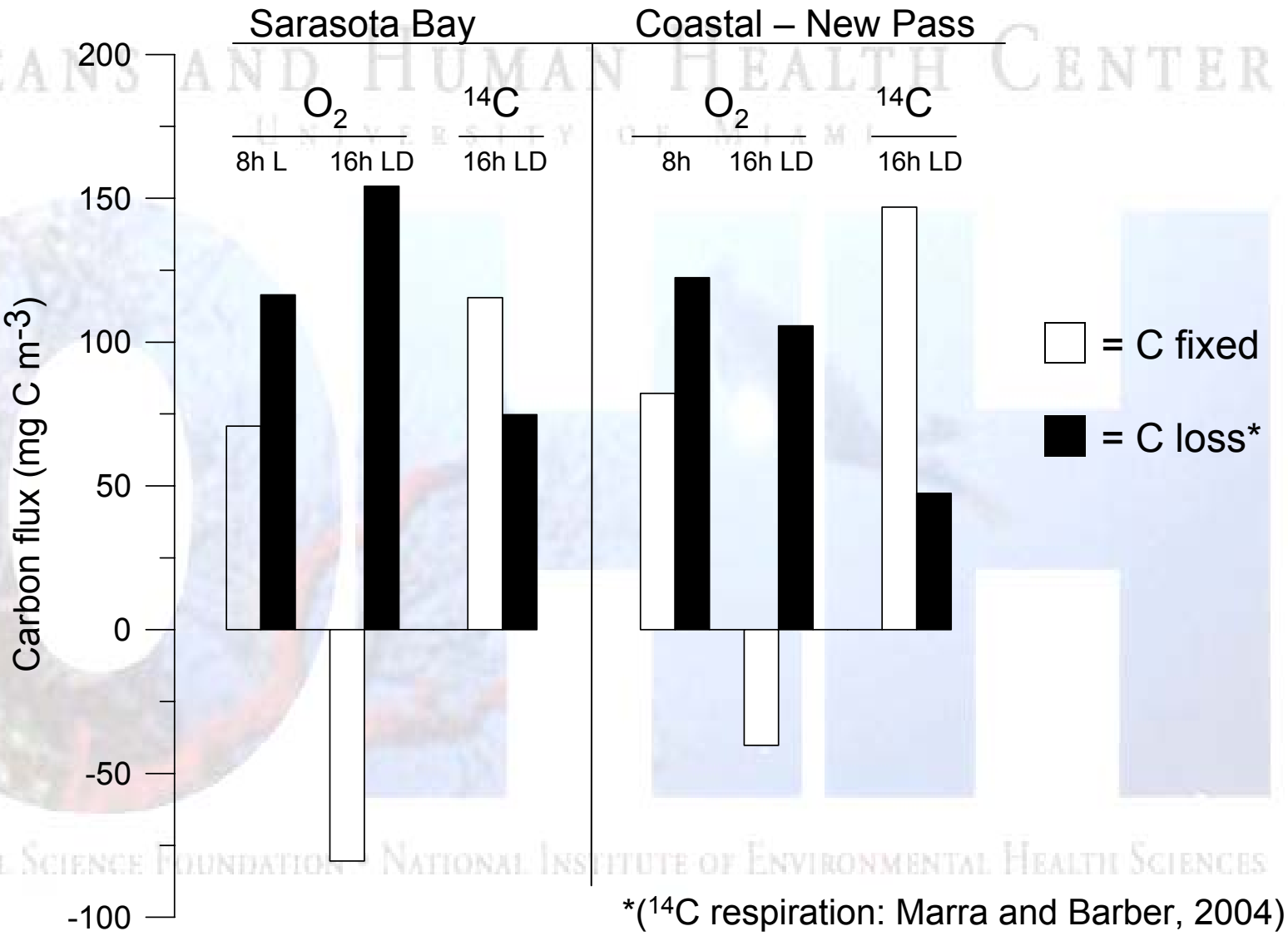


$^{18}O_2$

'Community' O_2 metabolism
('Winkler', Light - Dark bottle)

Gross Production: (L – D)
Net Production: (L – I)
Dark Respiration (I – D)

Carbon flux in *Karenia* blooms, August 2005



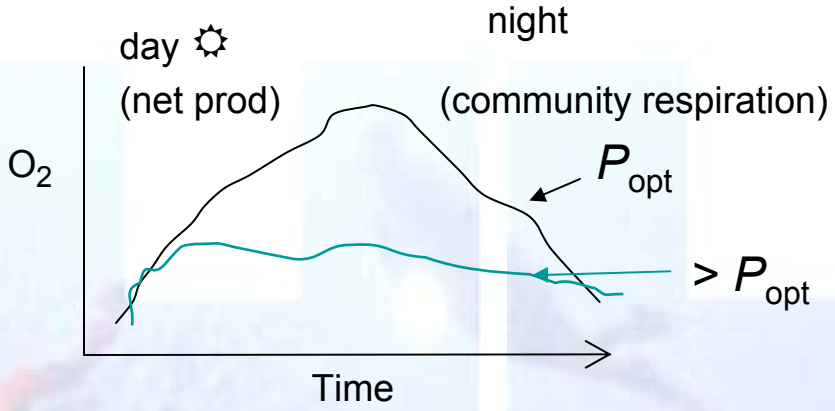
*(14C respiration: Marra and Barber, 2004)

In situ production measurements: Sarasota Bay

Incubation chamber & pulsed O_2 electrode

23 hour incubation; 1 hour open (dawn)

(Langdon et al., 1993, JGR Oceans (C4): 6645-6653)



G. Kirkpatrick, Mote Marine Lab:

'Brevebuster': *(Sellner et al., 2003)*

Mechanics

Sensor plate:
DC Motor

Tattletale Model TFX-11

Software Control (TxTools):
Sensor coefficients
(temp, light, O_2)
Sample interval
Chamber closure (delay)

On-off switch
Serial port