



# Effects of Nitrogen Loading on Greenhouse Gas Emissions from Salt Marshes in the US Northeast

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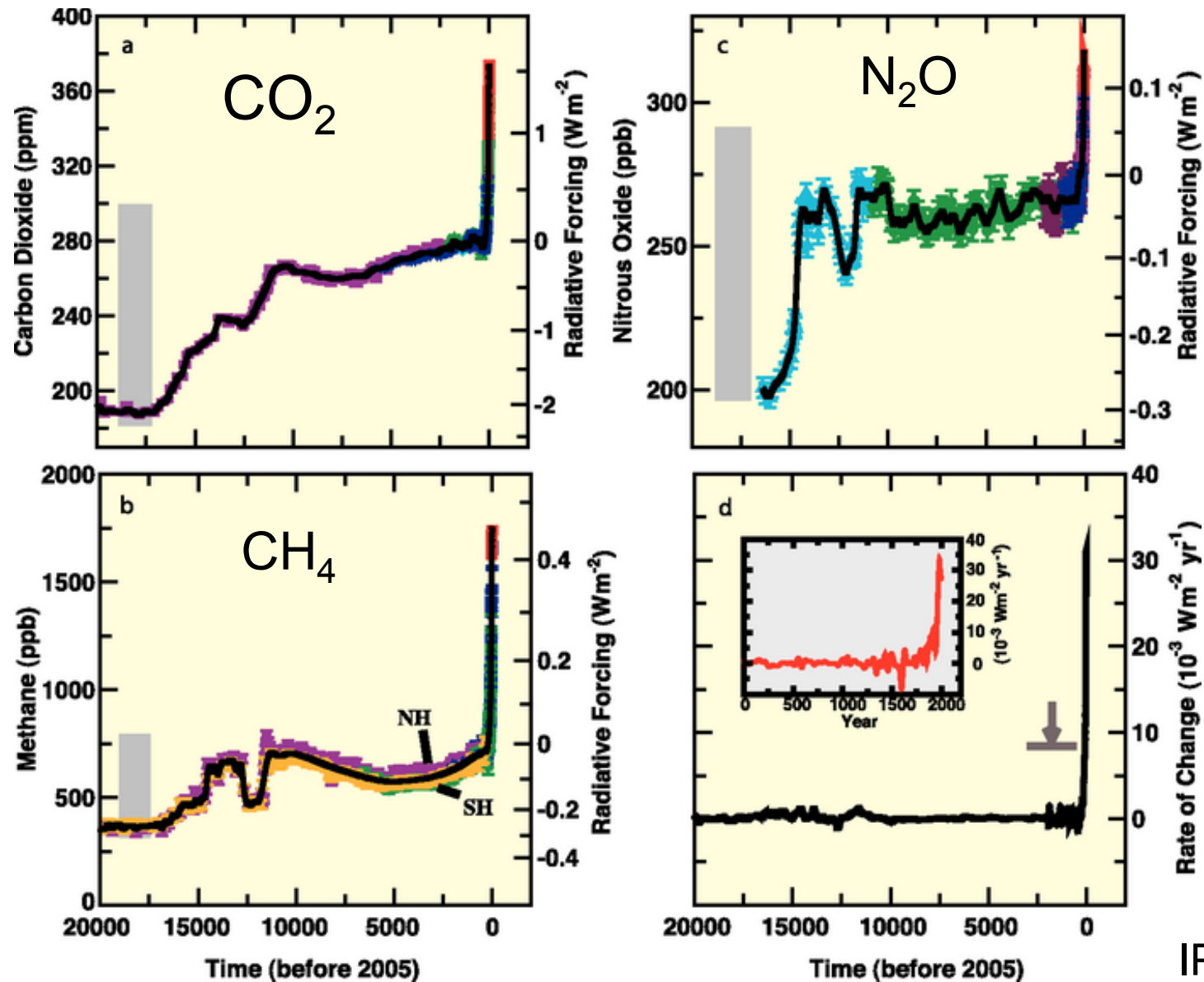
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# Atmospheric GHG concentration



IPCC 2007

# IPCC emissions factor for N<sub>2</sub>O

- 1% of fertilizer N (IPCC 2007)
- 2.5% of fertilizer N (Davidson 2009)
- 3-5% of fertilizer N (Crutzen et al. 2008)

Can we simply use the emissions factor to calculate N<sub>2</sub>O emissions?

# Questions

- With N loading, how much N is released as gases (including  $\text{N}_2\text{O}$ ), how much is retained, and how much is taken away by tidal water?
- How does N loading change  $\text{CO}_2$  and  $\text{CH}_4$  fluxes and carbon sequestration in soils?

# Conceptual framework

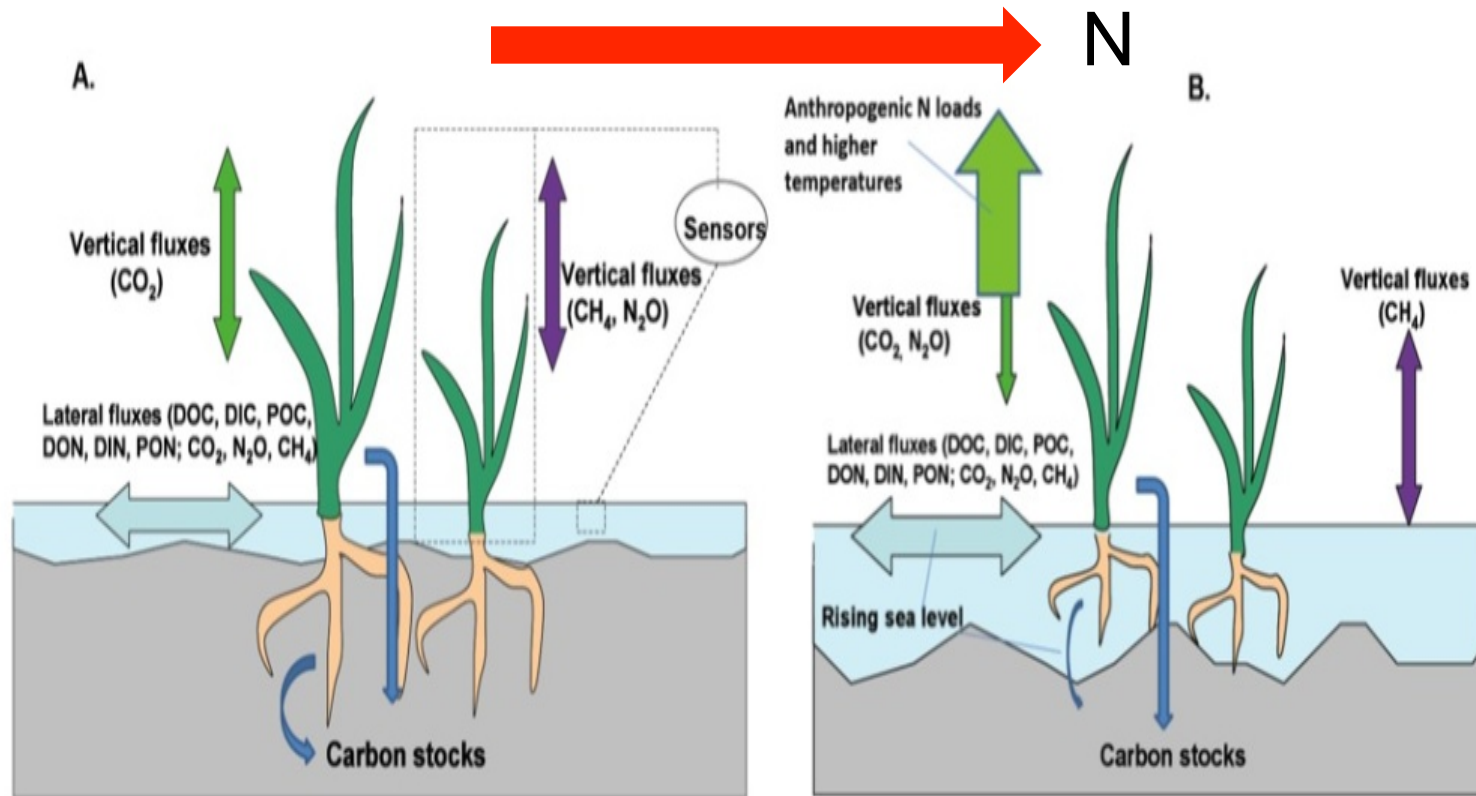


Fig. 2A. Diagram of GHG emissions and C sequestration (C stocks) in coastal wetlands; the dotted lines indicate measurement of vertical and lateral fluxes with sensors. B. Simplified presentation of hypothesized changes in vertical and lateral fluxes of GHGs and declines in C stocks with N loading, temperature, and sea level. Only a few of the potential effects of these factors have been illustrated in this figure.

# GHG and carbon sequestration

CO<sub>2</sub> equivalent =

$$\text{net CO}_2 \text{ flux} + \text{CH}_4 \text{ flux} * 25 + \text{N}_2\text{O flux} * 298$$

Net ecosystem C balance (NECB)

$$\text{NECB} = \text{NEP} - \text{RCH}_4 - \text{FL}.$$

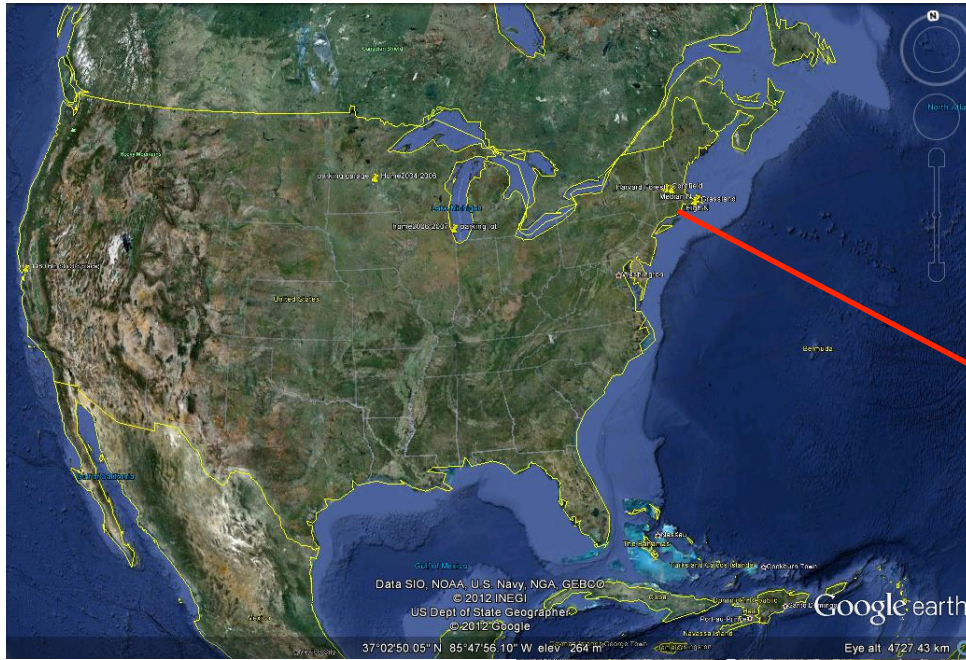
NEP: net ecosystem production of CO<sub>2</sub>,  
measured with the closed transparent chamber

RCH<sub>4</sub>: CH<sub>4</sub> flux measured simultaneously  
with NEP.

FL: net lateral flux

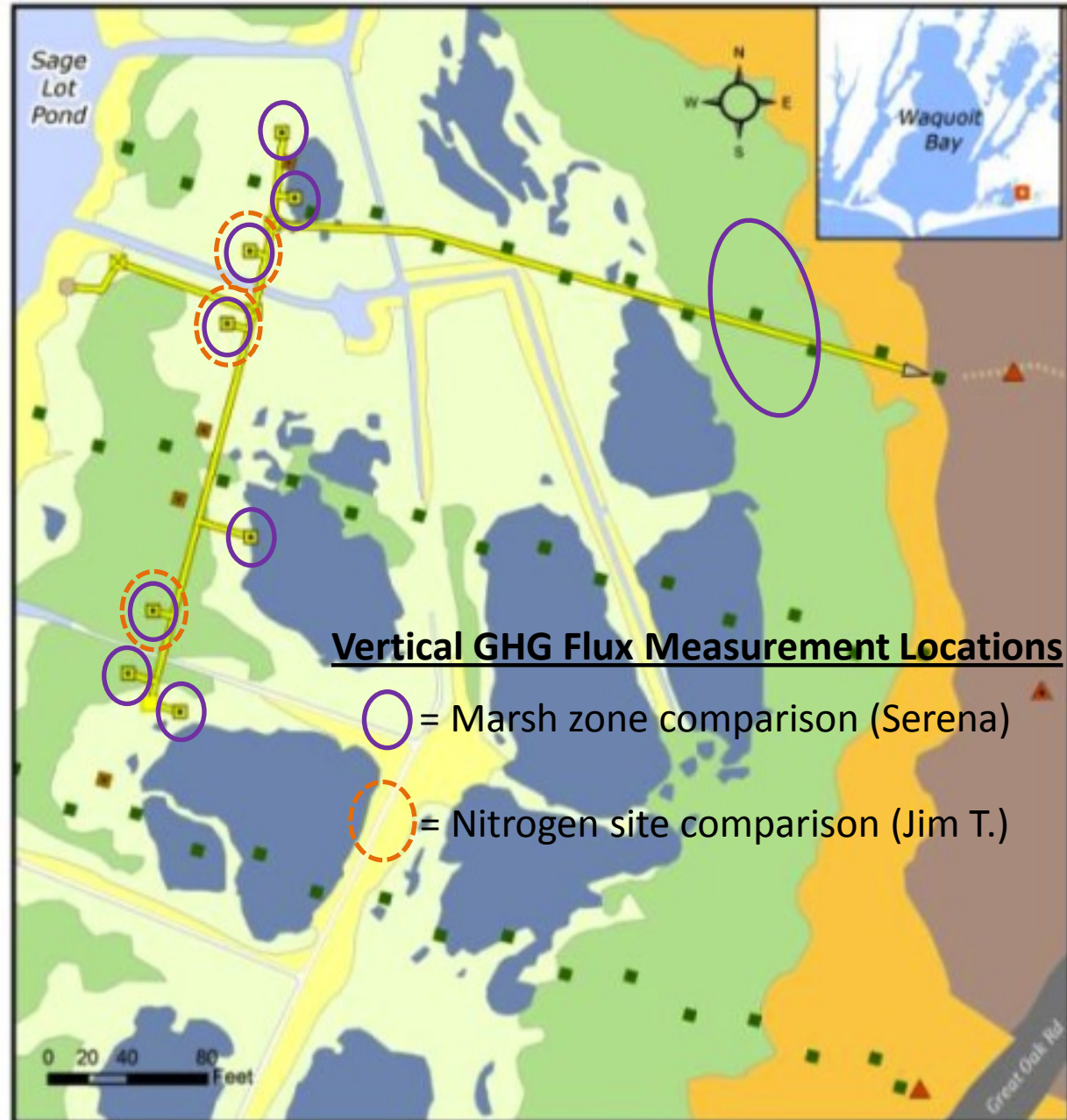


# Study sites





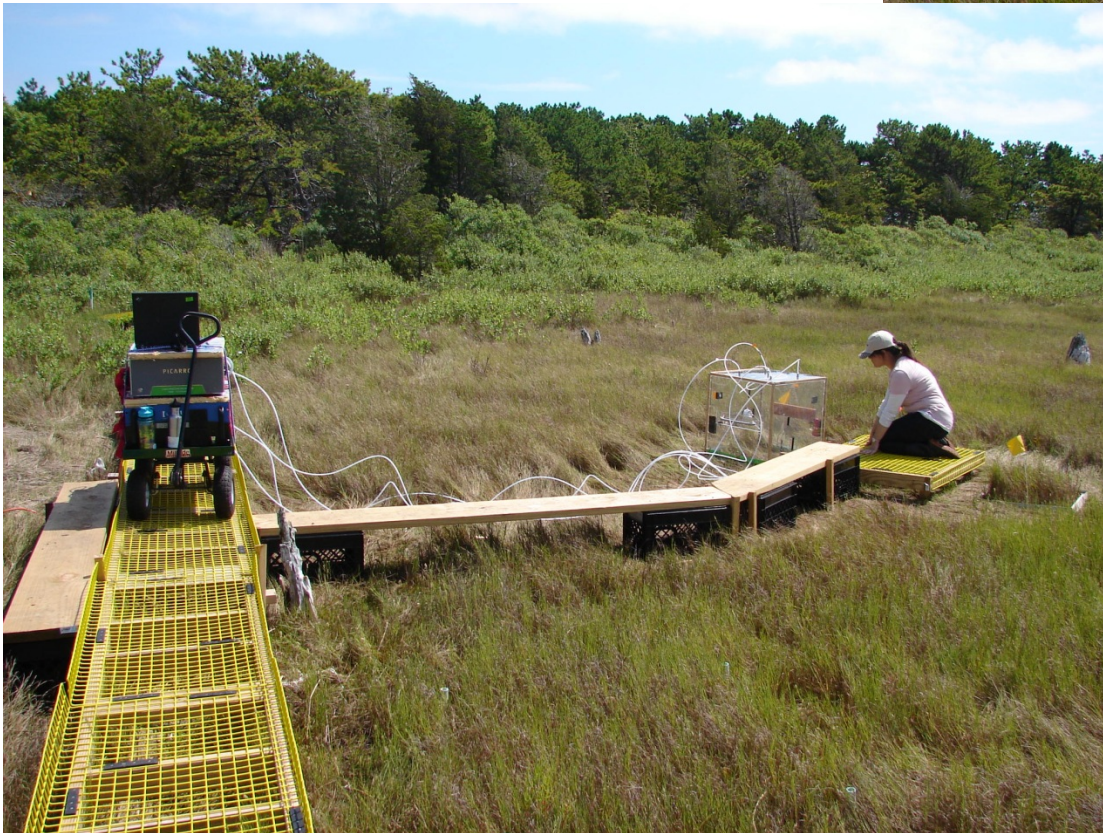
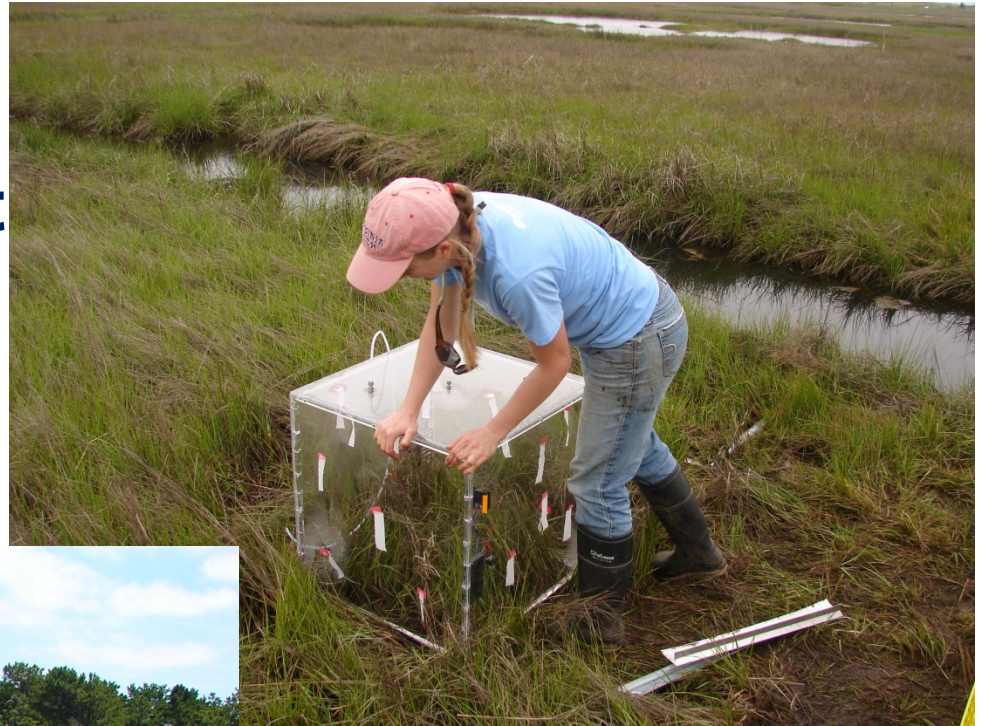
# Waquoit Bay NERR Salt Marsh Observatory Boardwalk

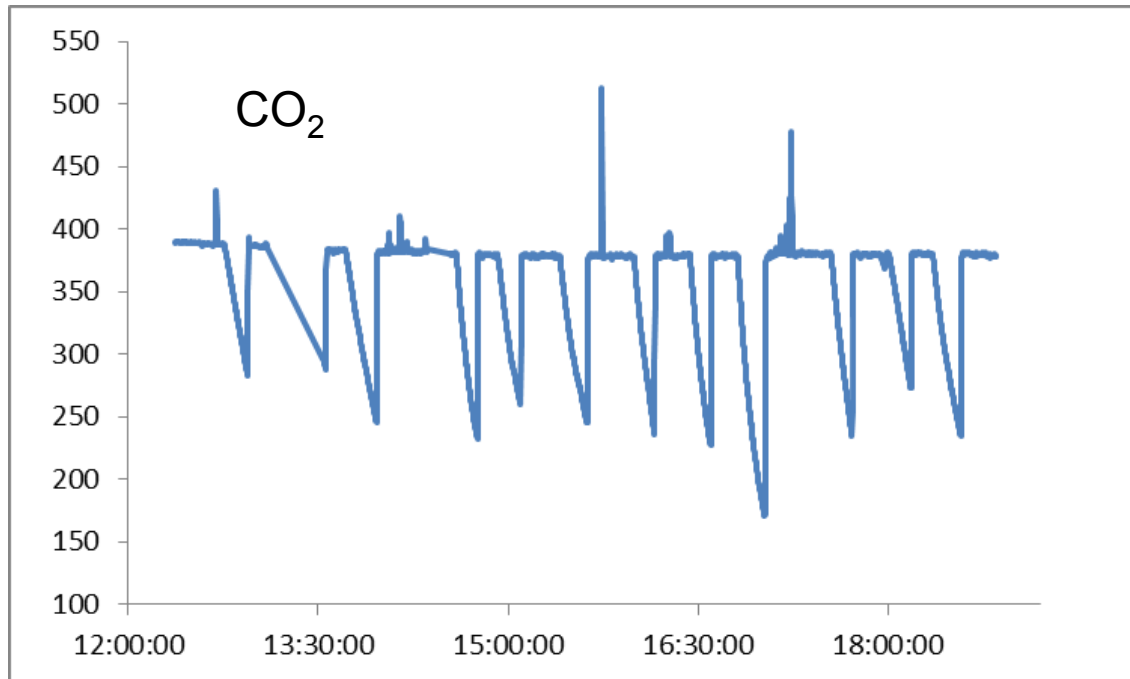


Created by: J. Mora, July 2012  
Habitat data (2004) source: WBNERR  
USGS orthos (2009) source: MassGIS  
NHESP (2008) source: MassGIS

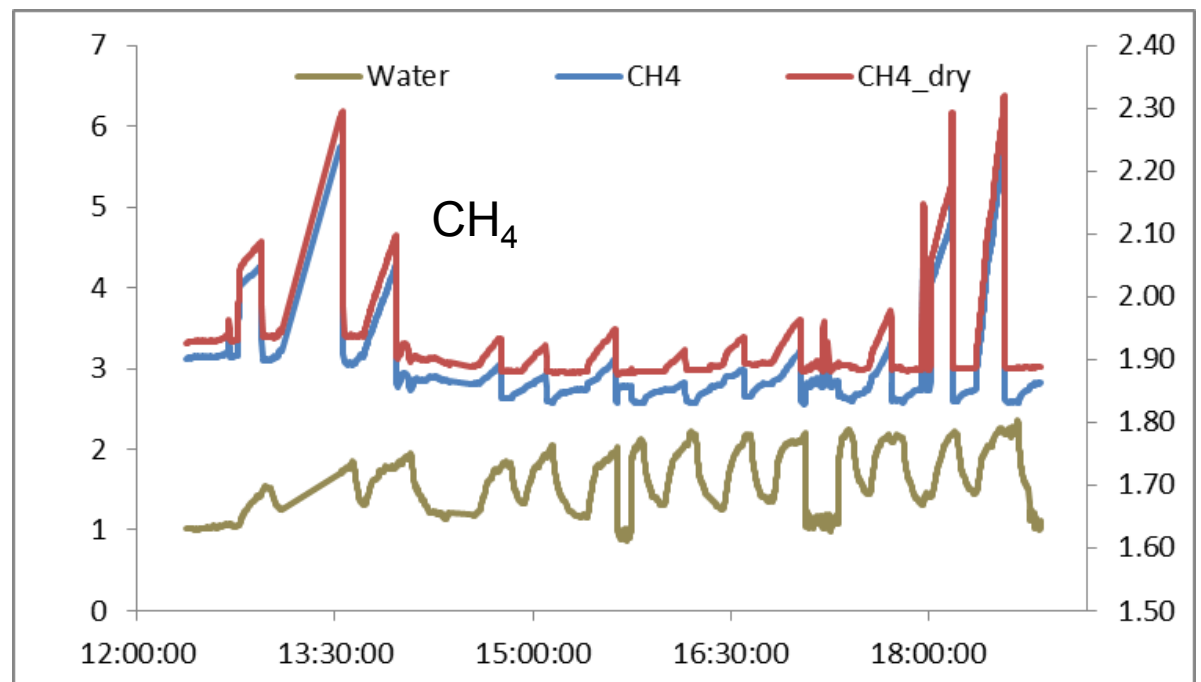


# GHG flux measurement



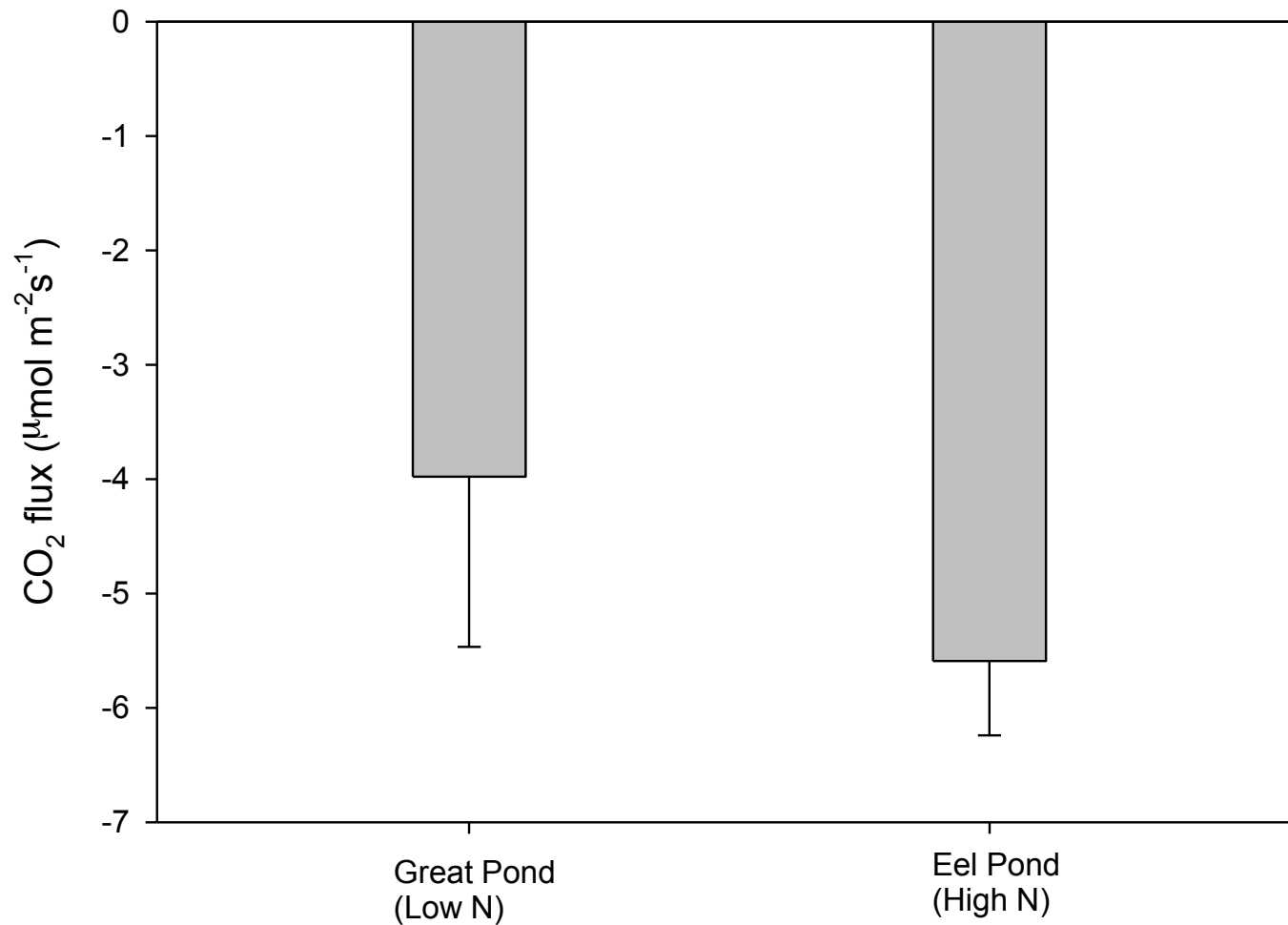


## Gas concentration inside the chamber



Preliminary results

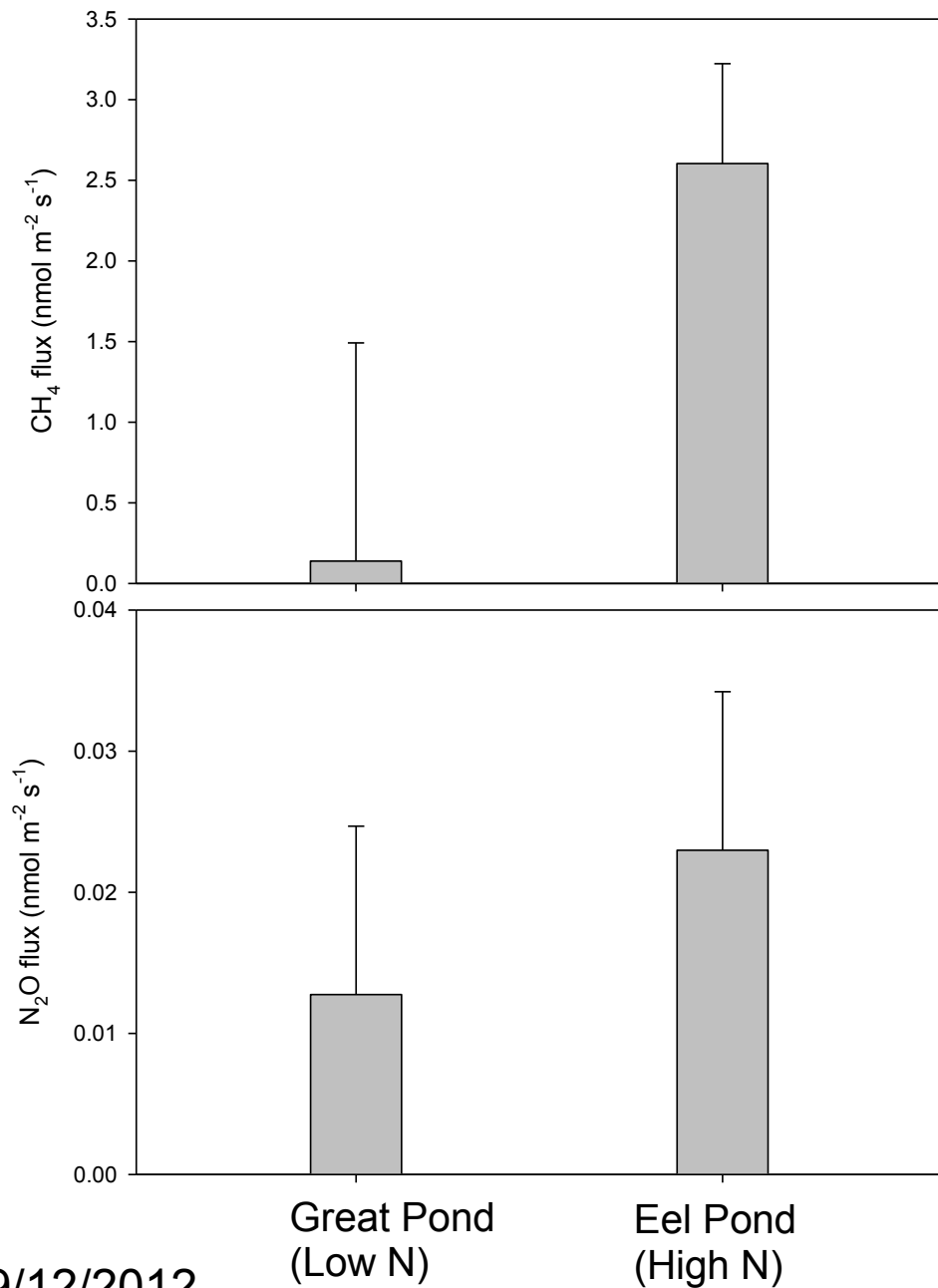
## CO<sub>2</sub> uptake in salt marshes



Measured on 9/12/2012 daytime



# $\text{CH}_4$ and $\text{N}_2\text{O}$ emissions in salt marshes



Measured on 9/12/2012

# Preliminary conclusion

- CO<sub>2</sub> uptake in salt marshes may increase with N loading, but CH<sub>4</sub> and N<sub>2</sub>O emissions also increase with N loading.

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