

CO<sub>2</sub> and N<sub>2</sub>O fluxes from coastal  
wetlands:

Is there any difference between wetlands  
and uplands?

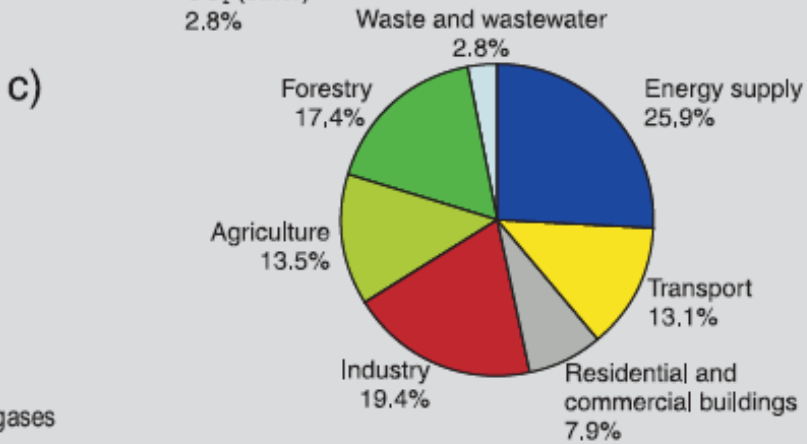
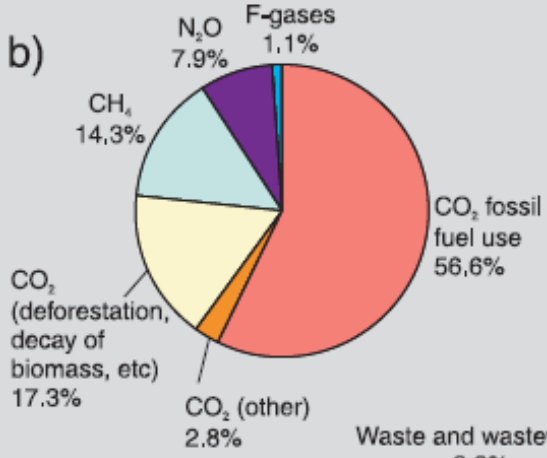
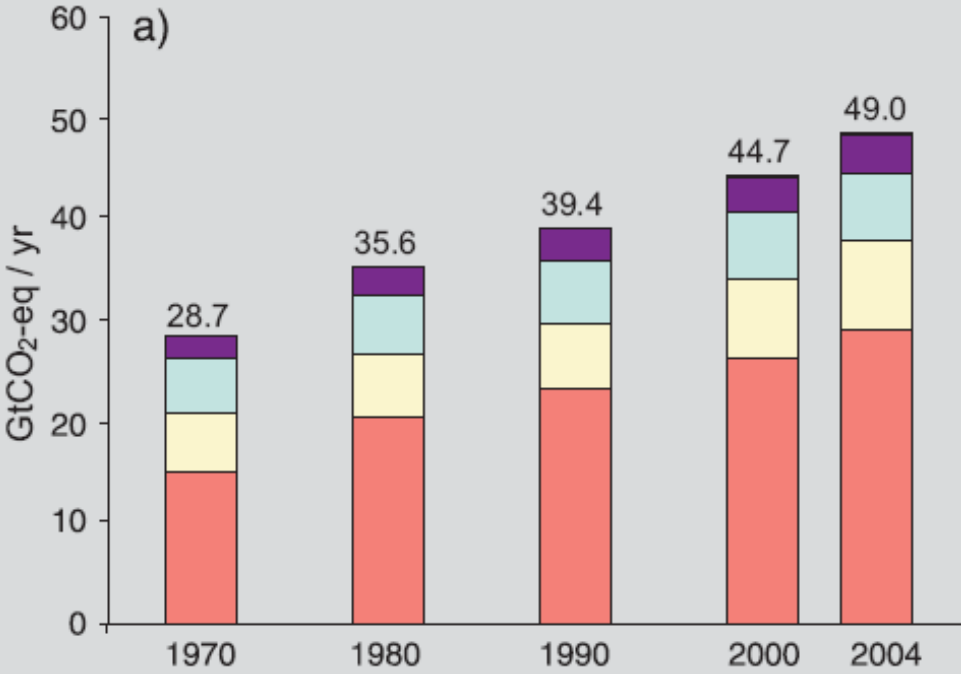
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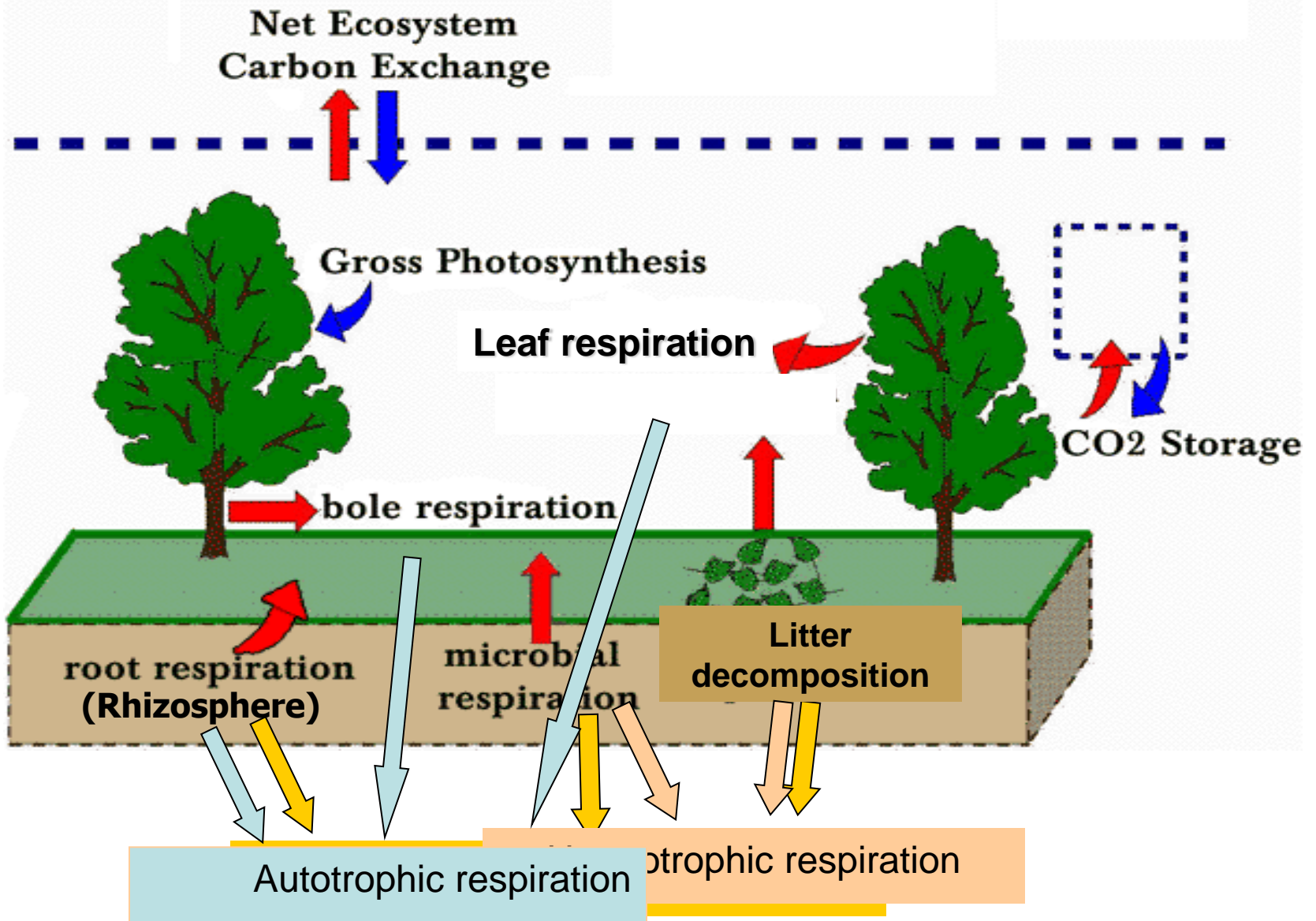
<sup>3</sup>University of Rhode Island, RI, USA

# Global anthropogenic GHG emissions

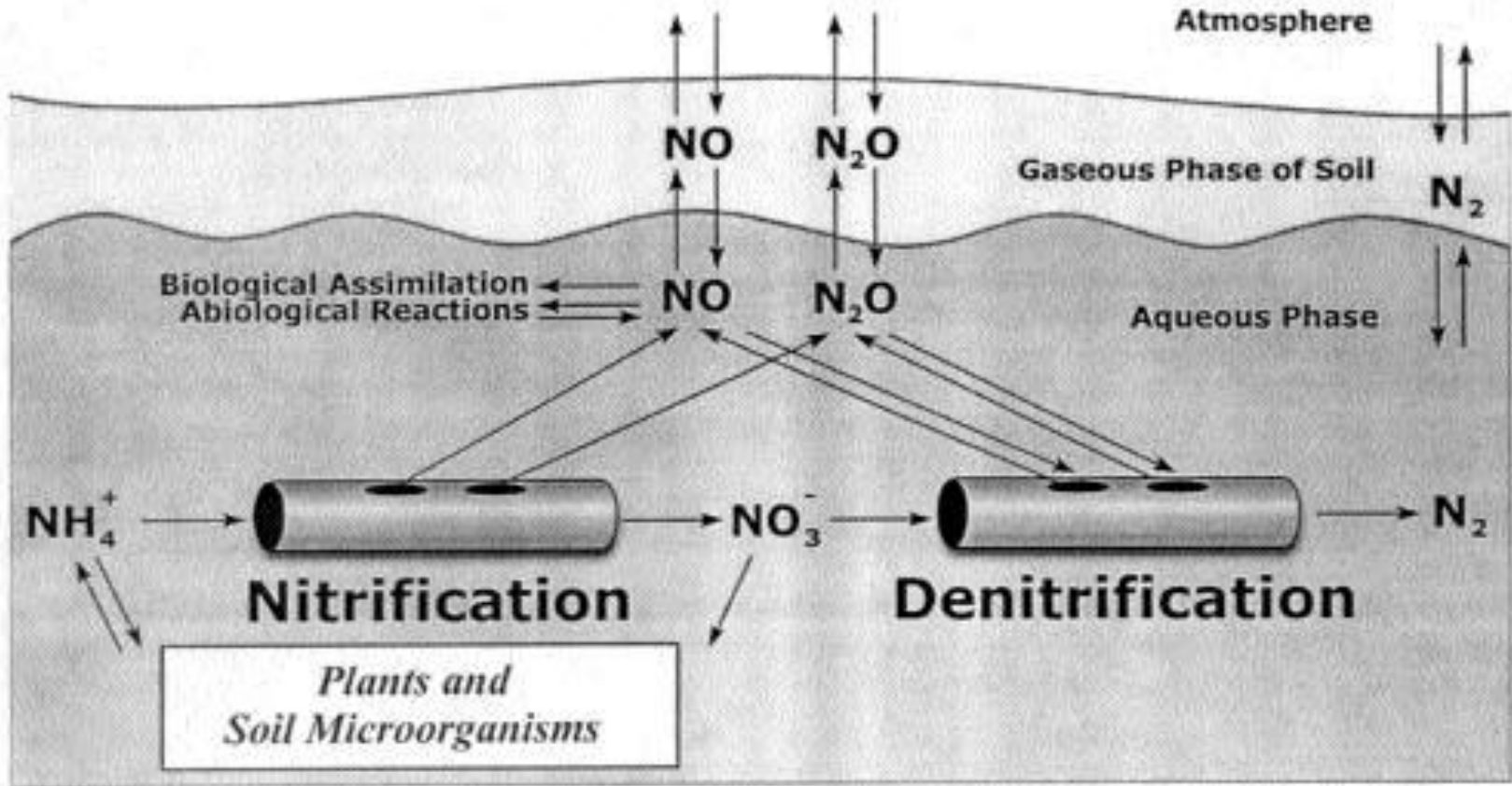


■ CO<sub>2</sub> from fossil fuel use and other sources     ■ CO<sub>2</sub> from deforestation, decay and peat  
■ CH<sub>4</sub> from agriculture, waste and energy     ■ N<sub>2</sub>O from agriculture and others     ■ F-gases

# Ecosystem carbon fluxes

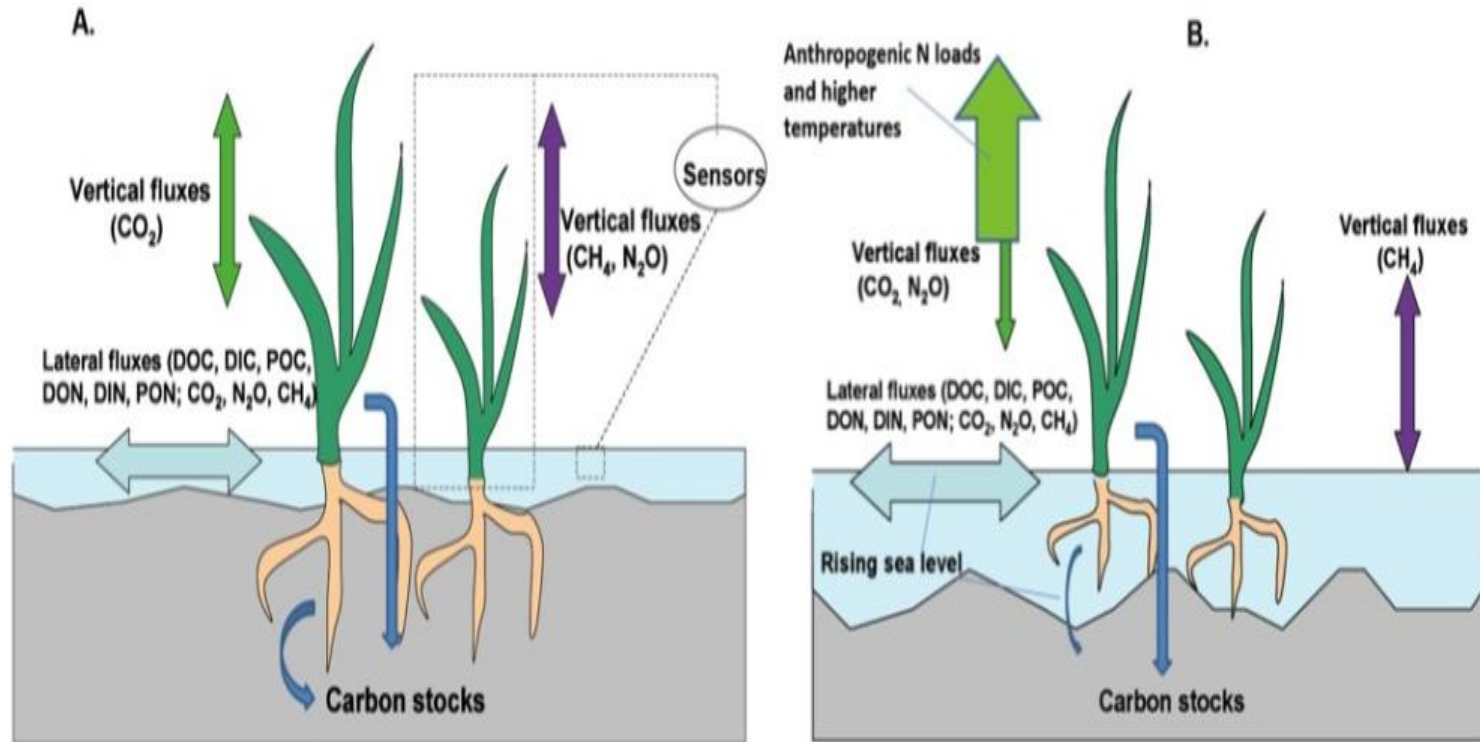


# N<sub>2</sub>O production and emissions



Hole-in-the-pipe model (Davidson et al. 2000)

# Conceptual framework



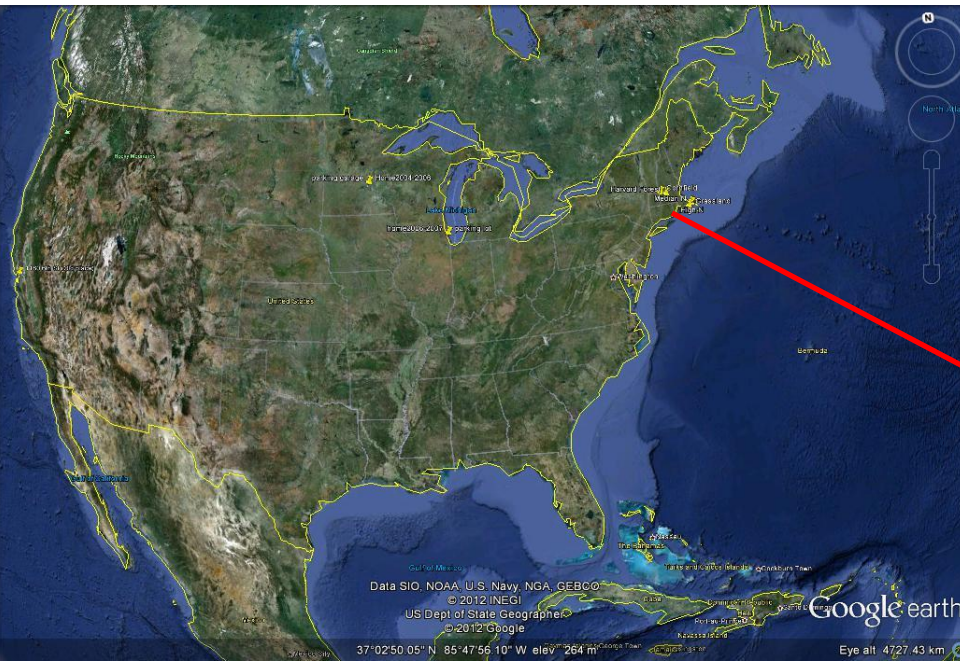
*Fig. 2A. Diagram of GHG emissions and C sequestration (C stocks) in coastal wetlands; the dotted lines indicate measurement of vertical and lateral fluxes with sensors. B. Simplified presentation of hypothesized changes in vertical and lateral fluxes of GHGs and declines in C stocks with N loading,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

# Research question

- How do GHG emissions and carbon sequestration in wetlands respond to anthropogenic N loading, climate, salinity, sea level, and vegetation composition?



# Study sites





# Eddy covariance

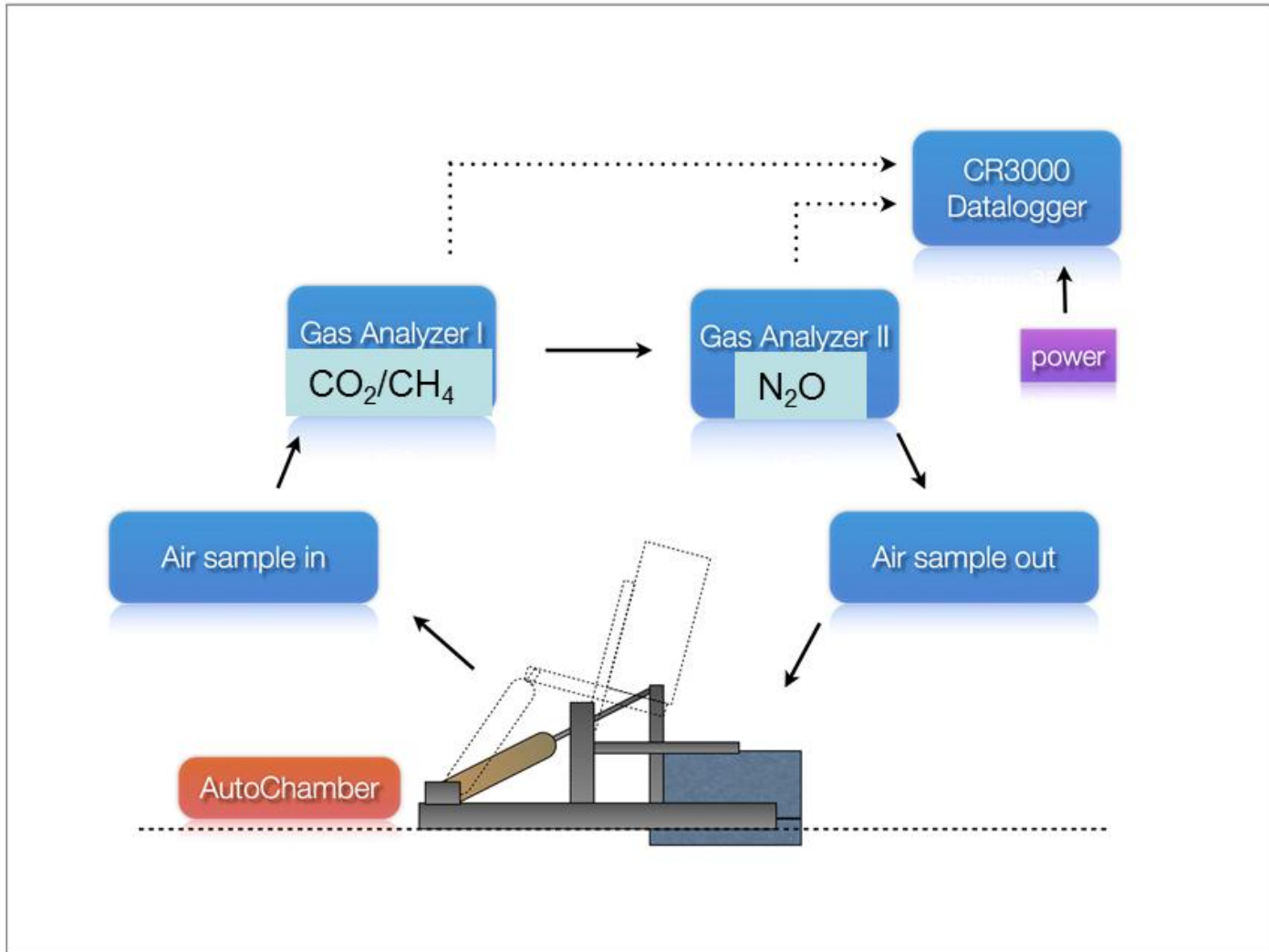
$$F = \overline{w'c'}$$



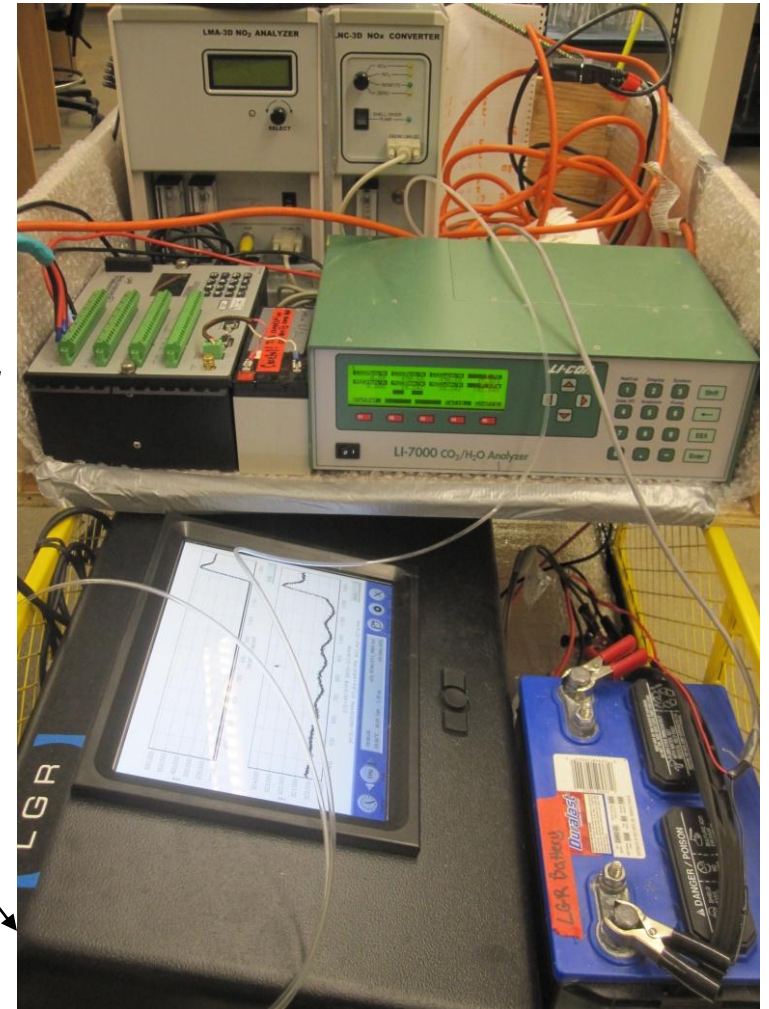
Forbrich et al.



# Chamber system



# GHG measurement system







# Lab incubation





# Carbon sequestration

## 1. Net ecosystem C balance (NECB)

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

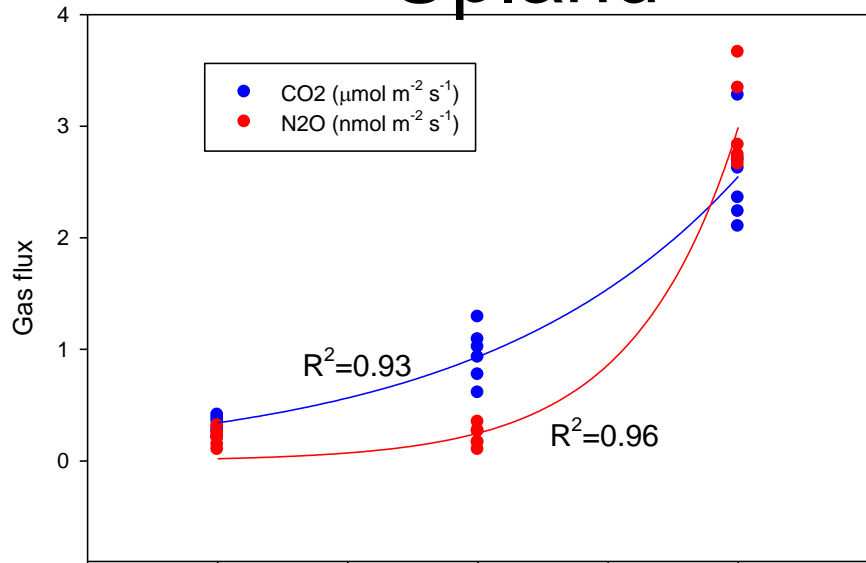
NEP: net ecosystem production, the net result of photosynthesis and ecosystem respiration, measured with the closed transparent chamber

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

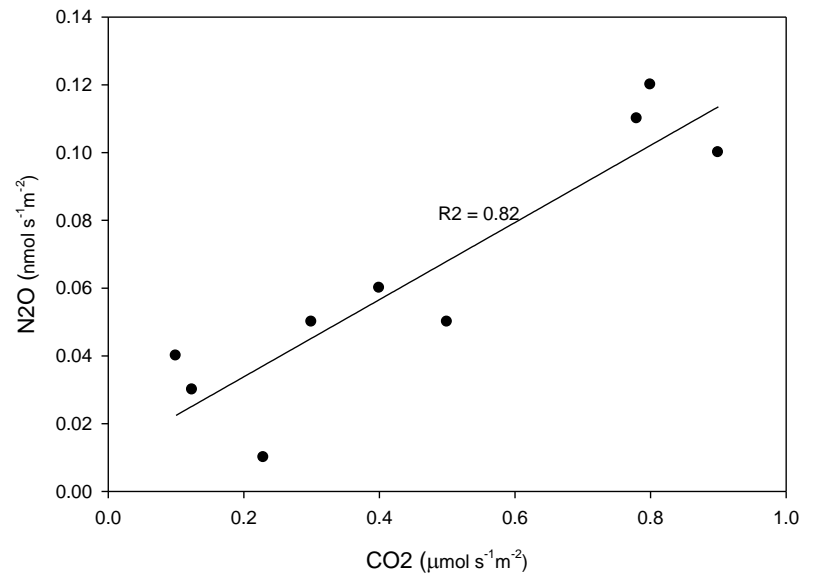
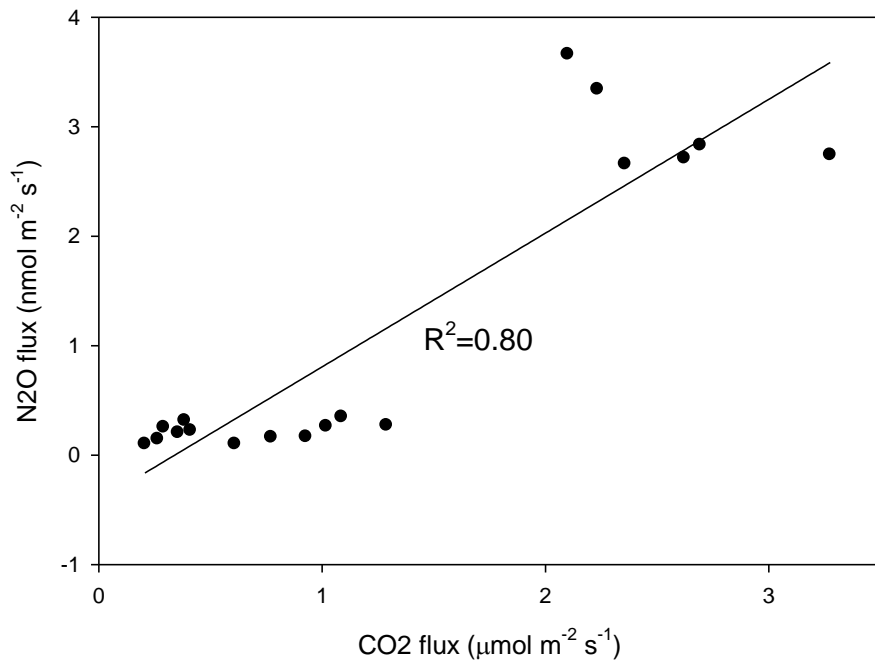
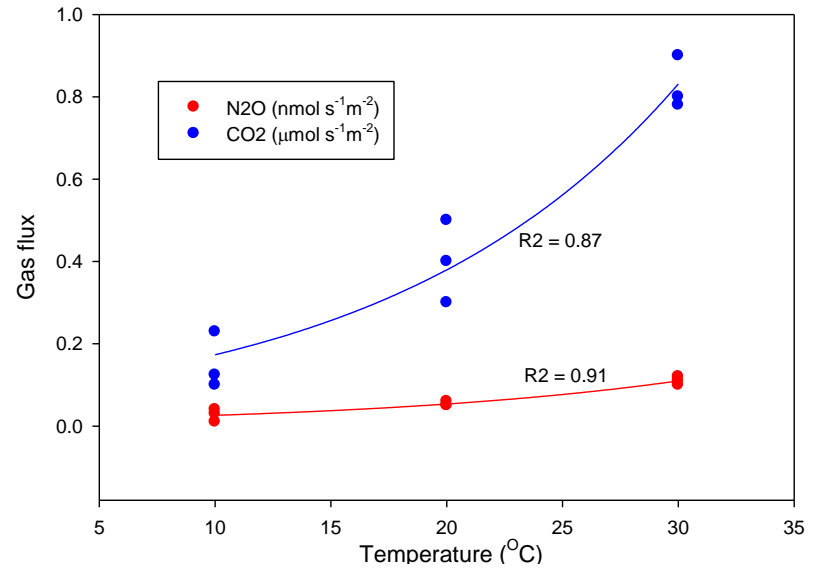
FL: net lateral flux

## 2. Soil carbon stocks and their changes

# Upland



# Wetland



# Preliminary conclusions

- Both  $\text{CO}_2$  and  $\text{N}_2\text{O}$  respond exponentially to temperature in the wetland and upland.
- $\text{CO}_2$  and  $\text{N}_2\text{O}$  emissions were lower in the wetland than the upland.

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