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Methane and nitrous oxide emissions in freshwater swamps and marshes in southeastern México

Marín-Muñiz J. Luis, Hernández A. María E., and Moreno-Casasola Patricia.

Introduction

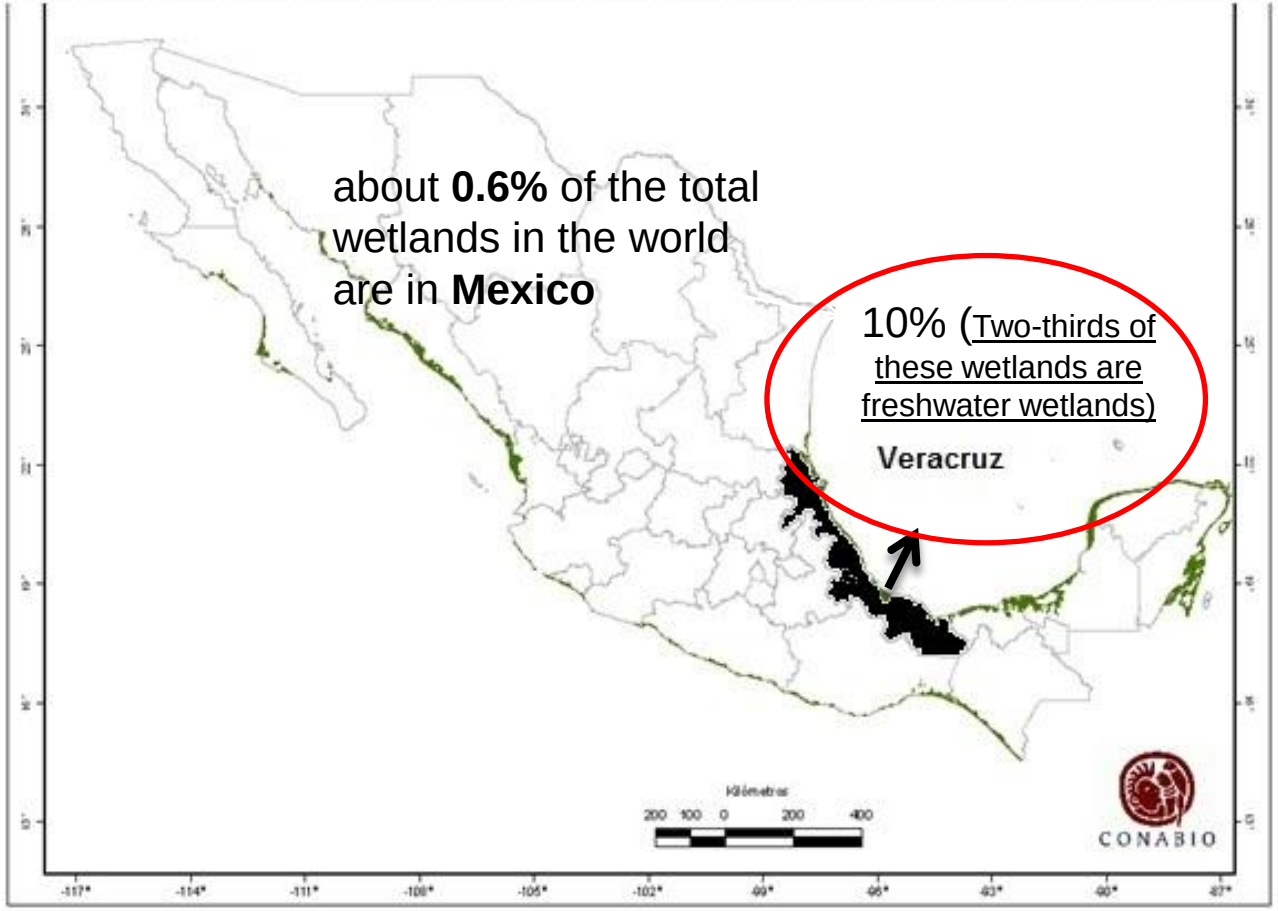
Wetlands ecosystems

-Wetlands are considered carbon sinks. However, they are also significant source of greenhouse gases (GHG).

-CH_4 and N_2O are two important GHG with 20 and 300 times GWP than $CO_{2,}$ respectively.

- Few studies about GHG emissions has been done in tropical wetlands.

Wetlands in Mexico

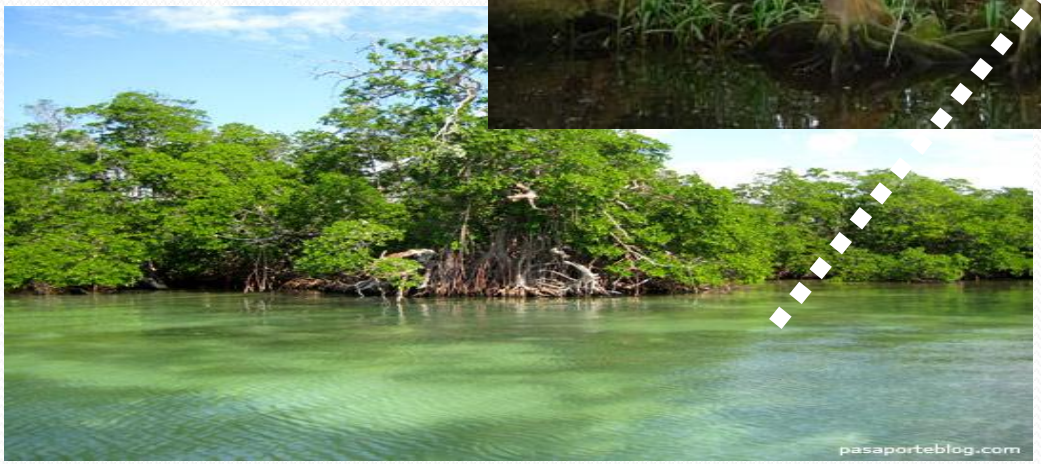


Source: Olmsted (1993)

Freshwater wetlands

Marshes

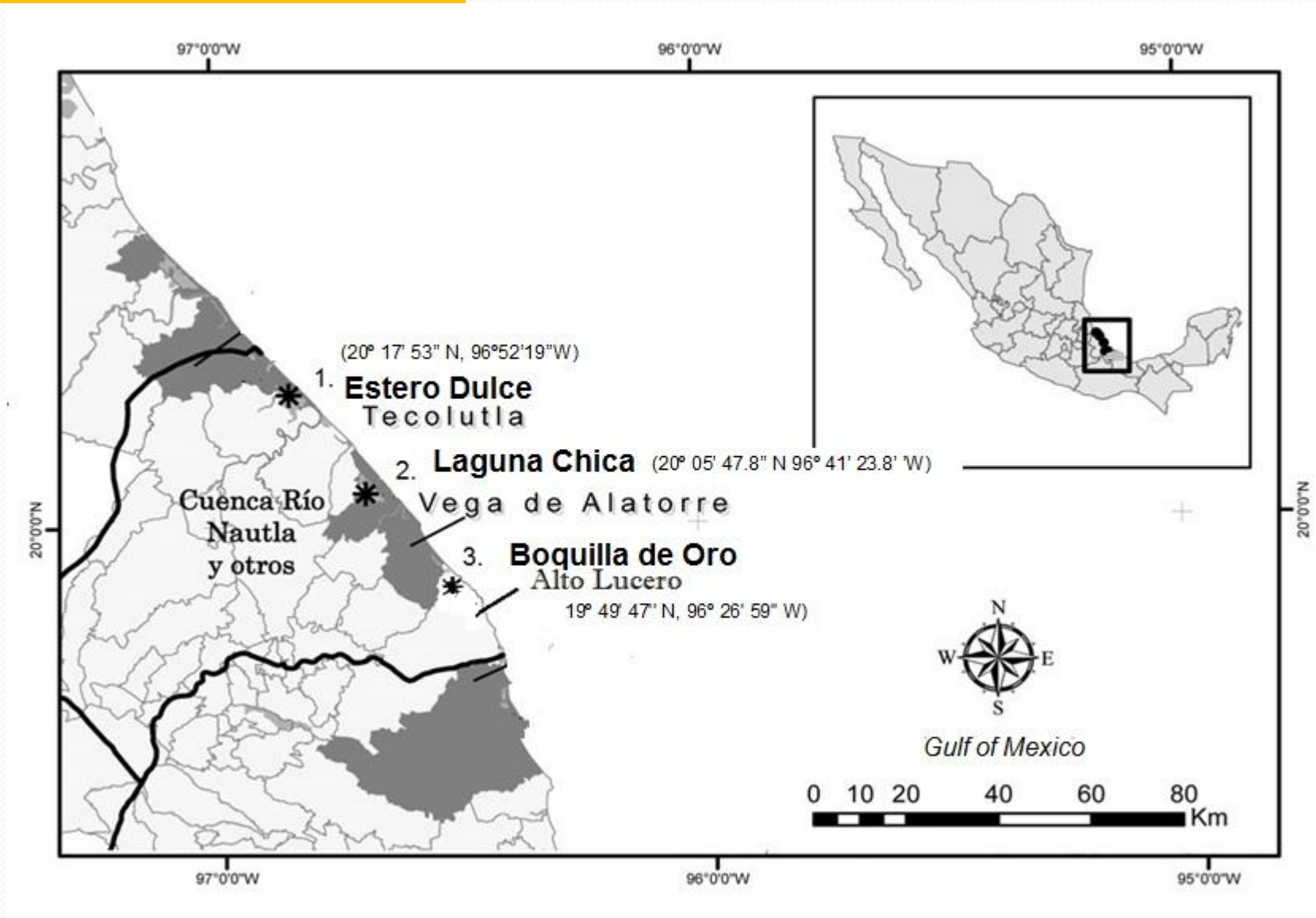
Swamps



Objective

Quantify and compare methane and nitrous oxide emissions in coastal freshwater wetlands with different plant community (swamps vs masrhes) in southaestern Mexico

Methods



Location of the study sites in the coastal plain of Veracruz, Mexico.

Estero Dulce (ED)

Thalia geniculata ,Cyperus giganteus, Echinochloa pyramidalis.

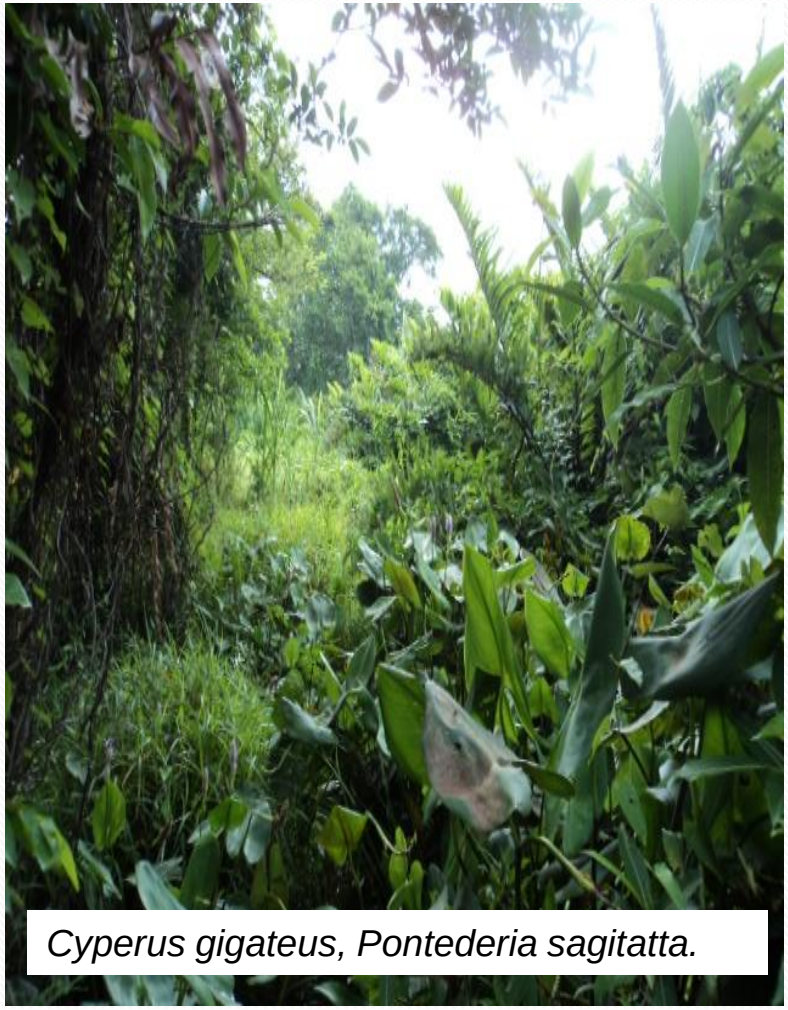
Pachira aquatica

Laguna Chica (LCH)

Cyperus giganteus , Typha domingensis

Pachira aquatica, Hippocratea celastroides

Boquilla de oro (BO)



Cyperus gigateus, Pontederia sagitatta.

Ficus insipida

Methods

Gas sampling

- Closed chambers (every 2 months)

Gas analysis

Gas chromatograph

(Perkin Elmer)

-Methane and nitrous oxide fluxes were estimated according to the following equation:

$$Fc = (\Delta c/t) * (V/A)$$

Data analysis

The data were performed with SPSS 18 version for windows.

Field measurements

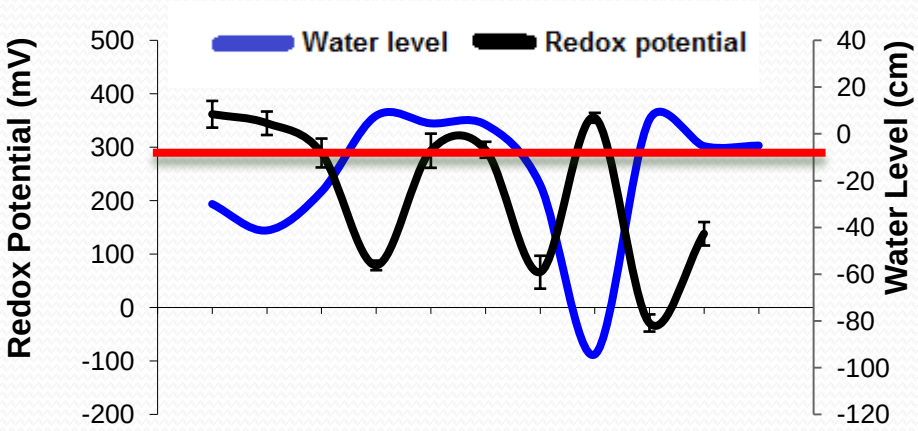
- Redox Potential
-Water level
-Water chemistry

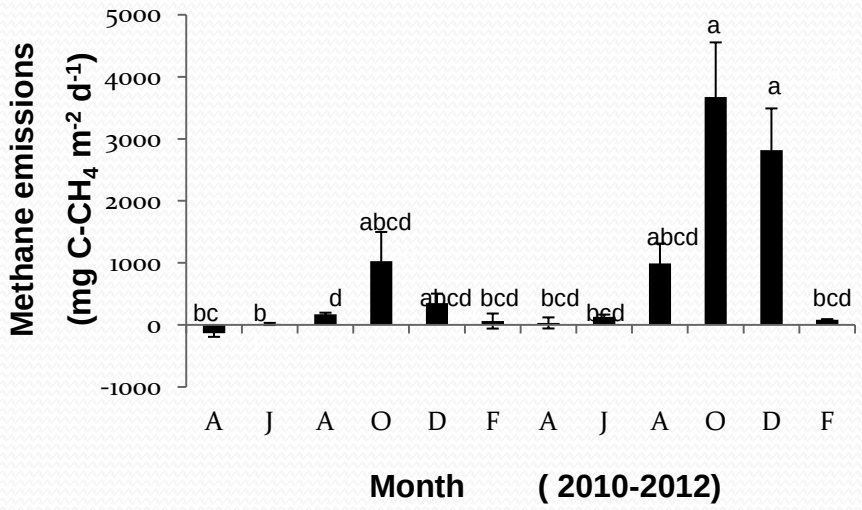
Methane Emissions

Results

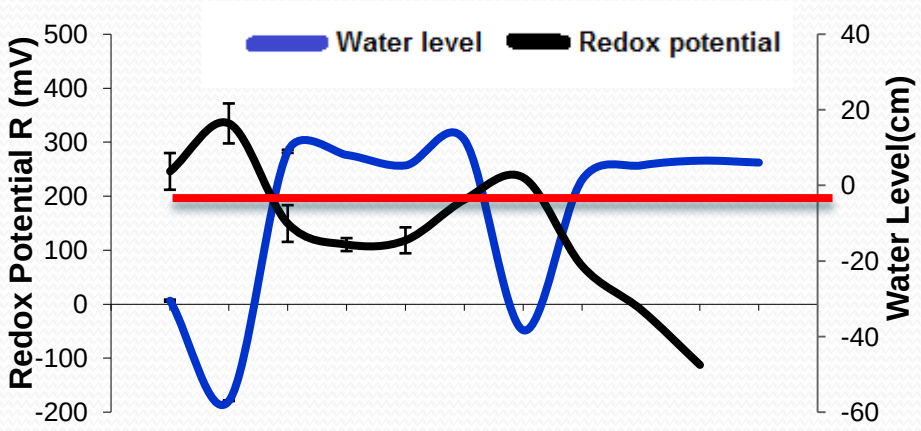
Boquilla de Oro

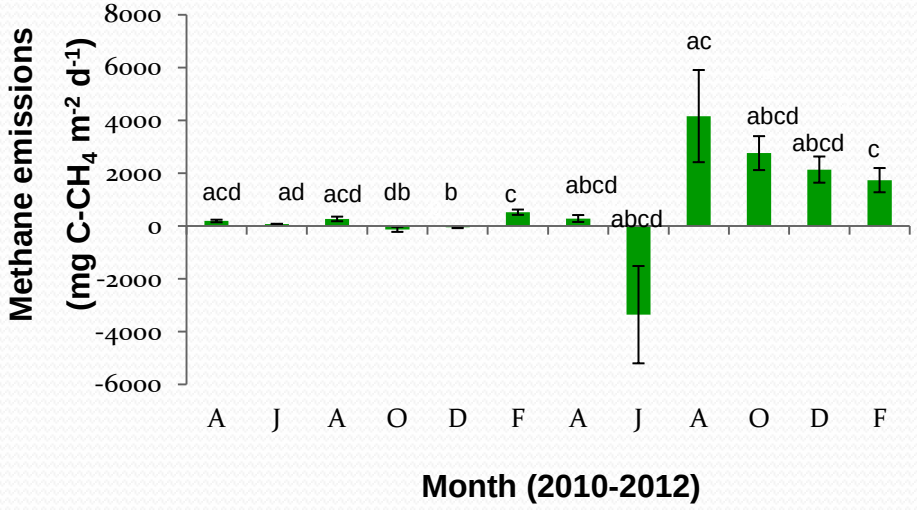
Swamps





Marshes



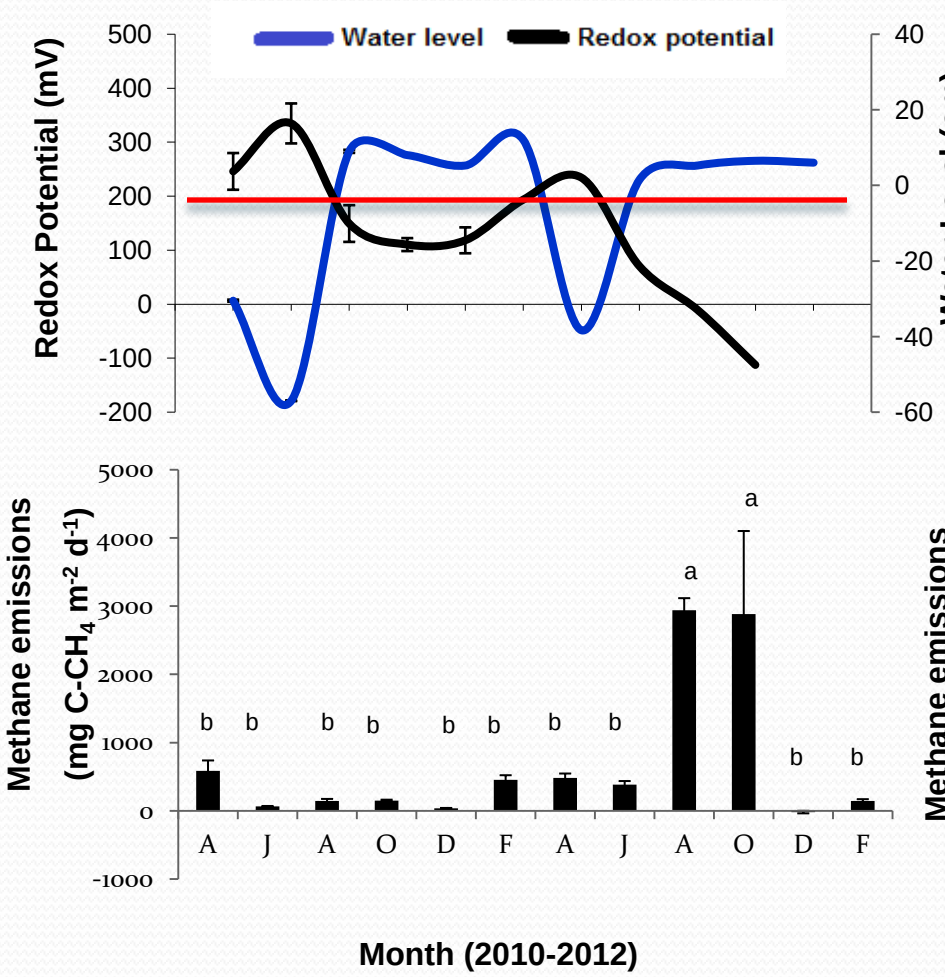


Methane emissions in Boquilla de Oro. Values are means (n=4), bars represent standart error, and letters indicate significant difference at level of $p<0.05$.

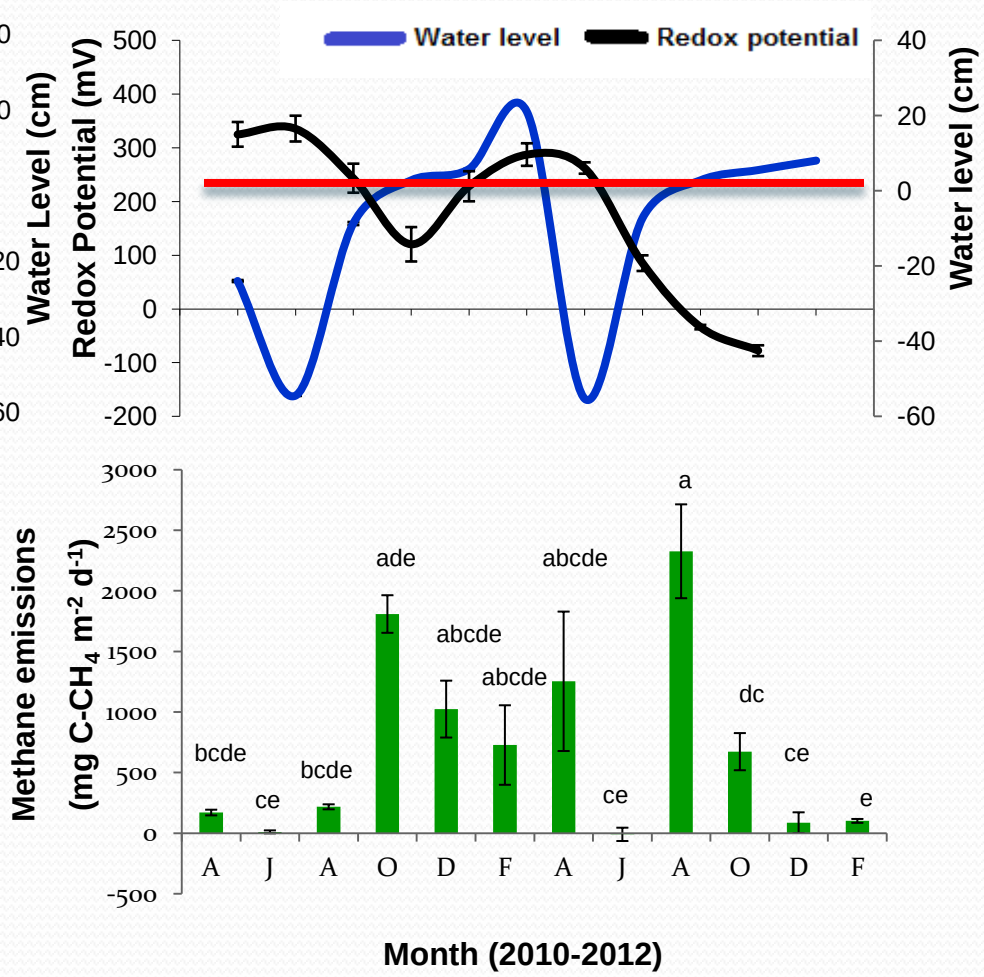
Results cont.

Laguna Chica

Swamps



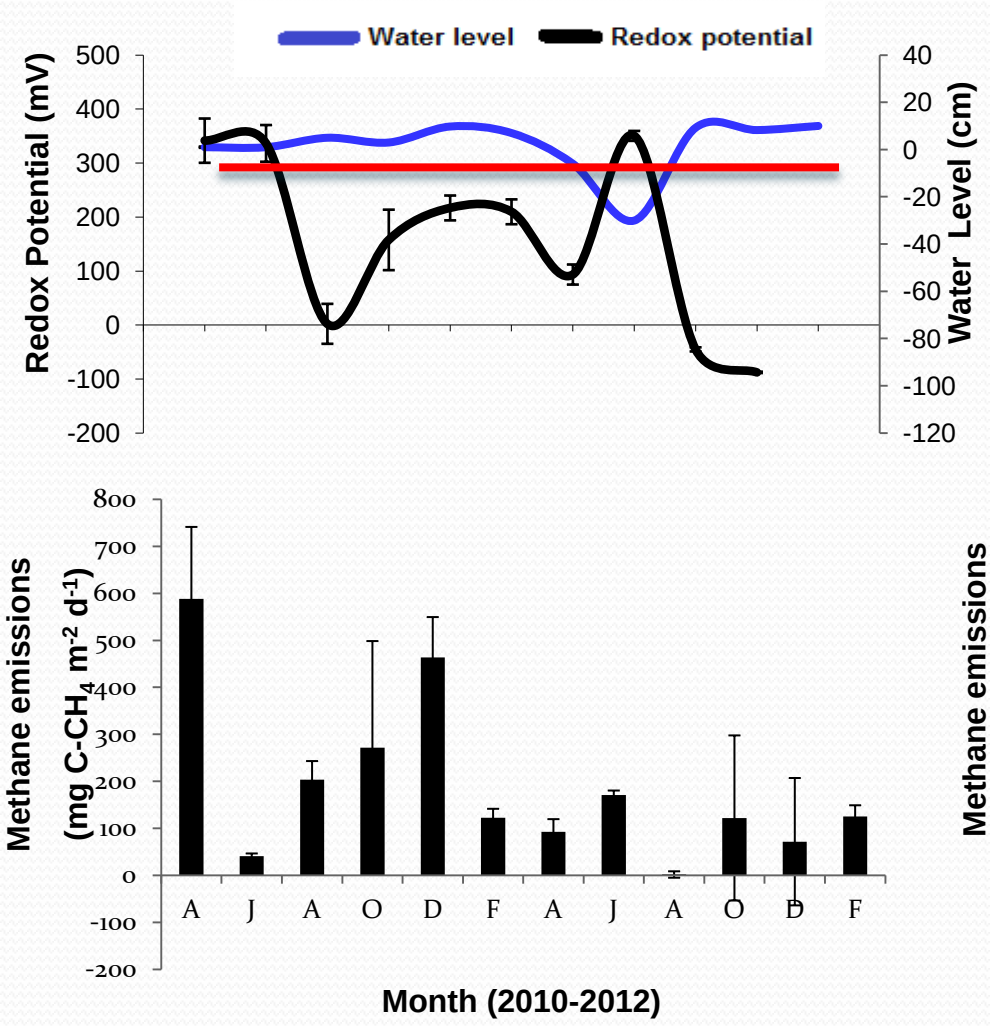
Marshes

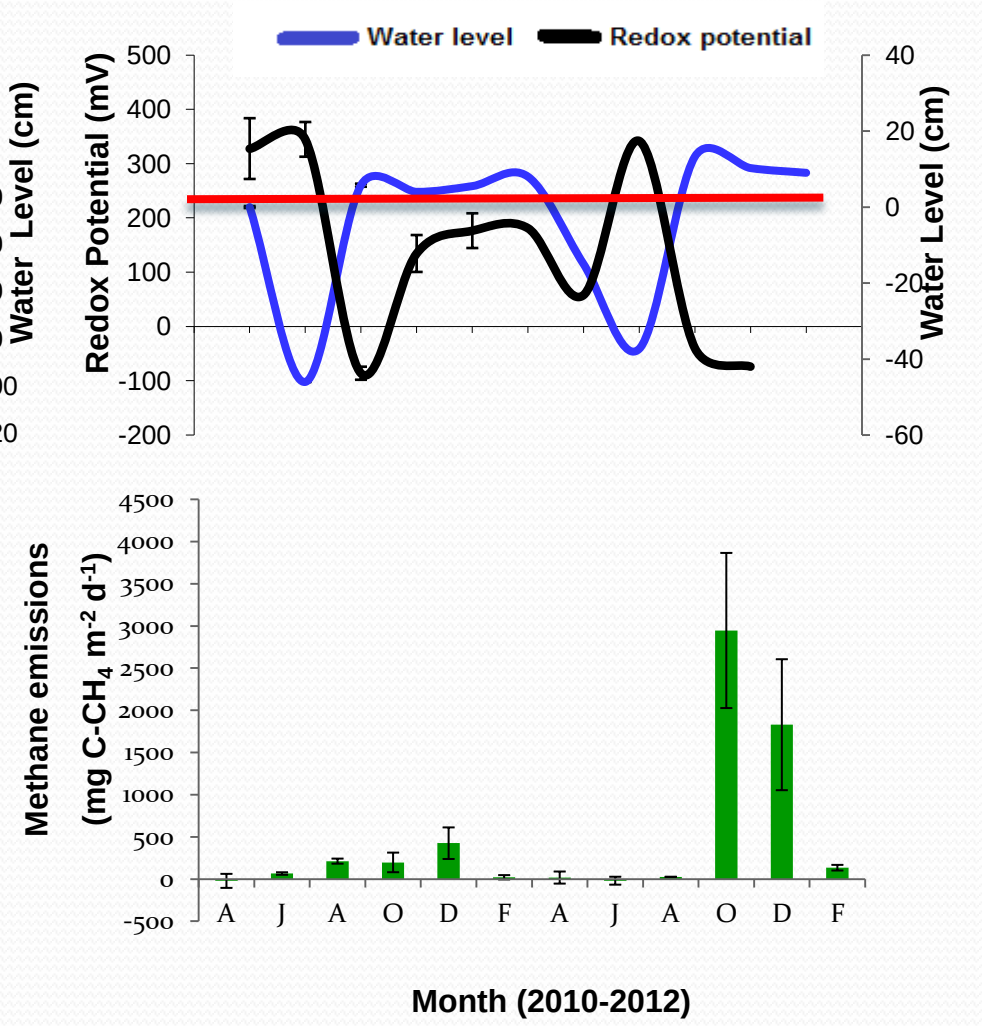


Methane emissions in Laguna Chica. Values are means (n=4), bars represent standart error, and letters indicate significant difference at level of $p<0.05$.

Results cont.

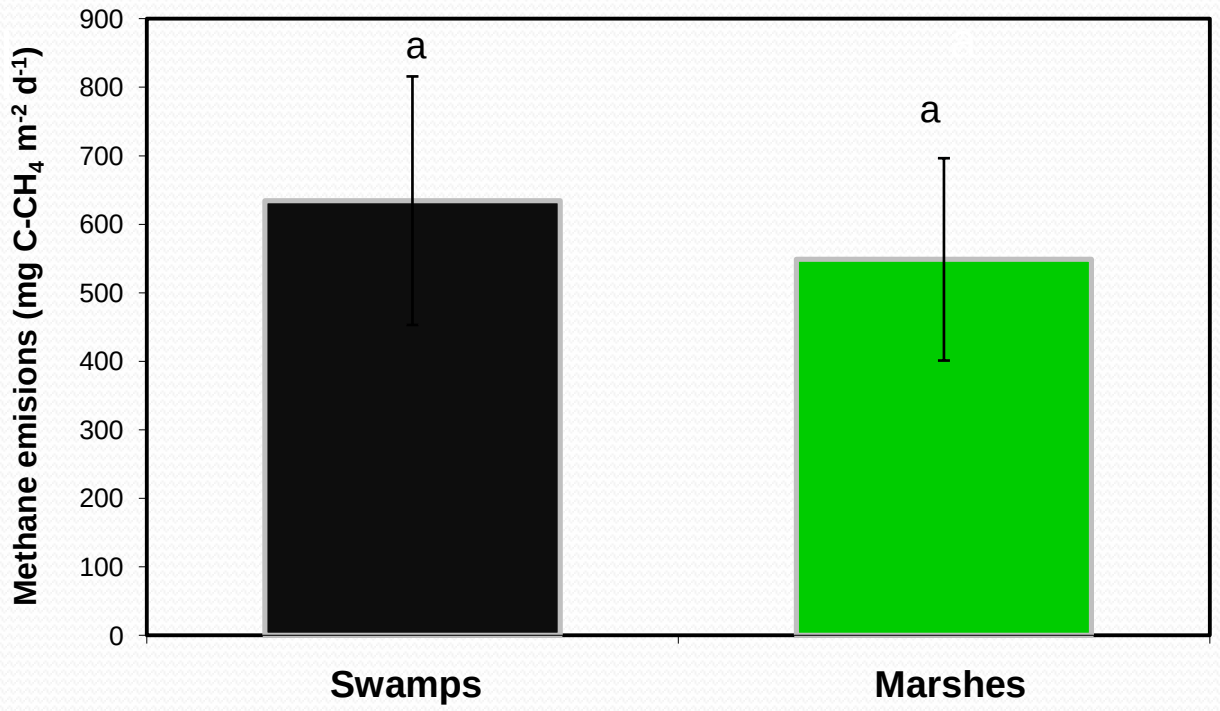
Swamps **Estero Dulce** Marshes





Methane emissions in Estero Dulce. Values are means (n=4), bars represent standart error, and letters indicate significant difference at level of $p<0.05$.

Results cont.



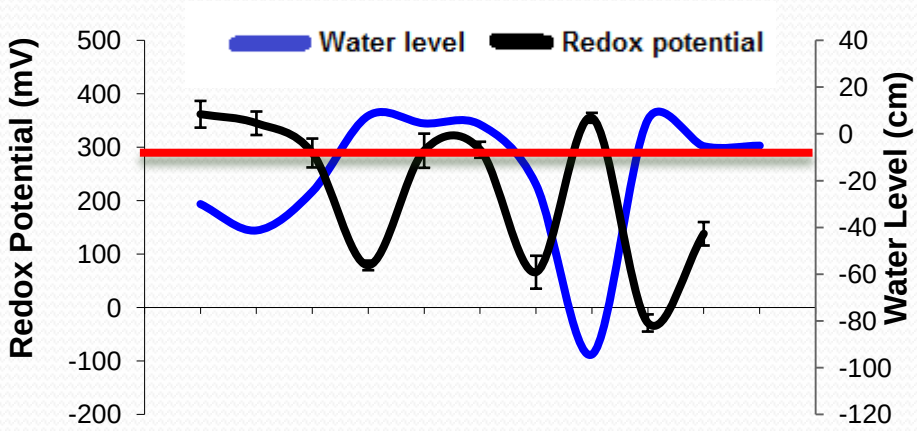
Methane emissions in wetlands with different plant community. Values are means (n=144). Bars indicate standard errors. Same letters indicate no significant differences ($p>0.05$).

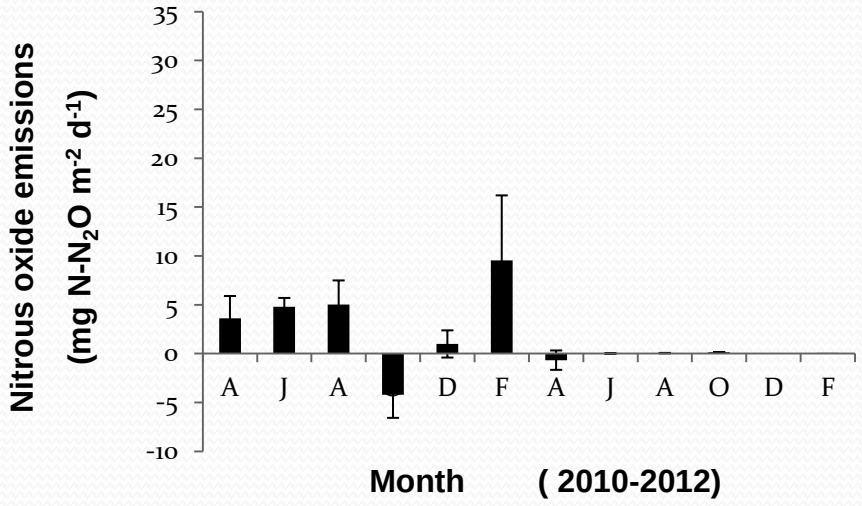
Nitrous oxide emissions

Results

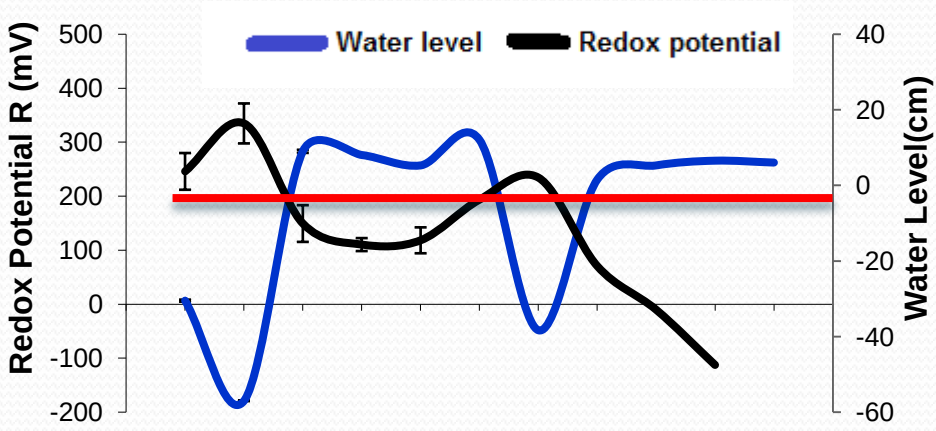
Boquilla de Oro

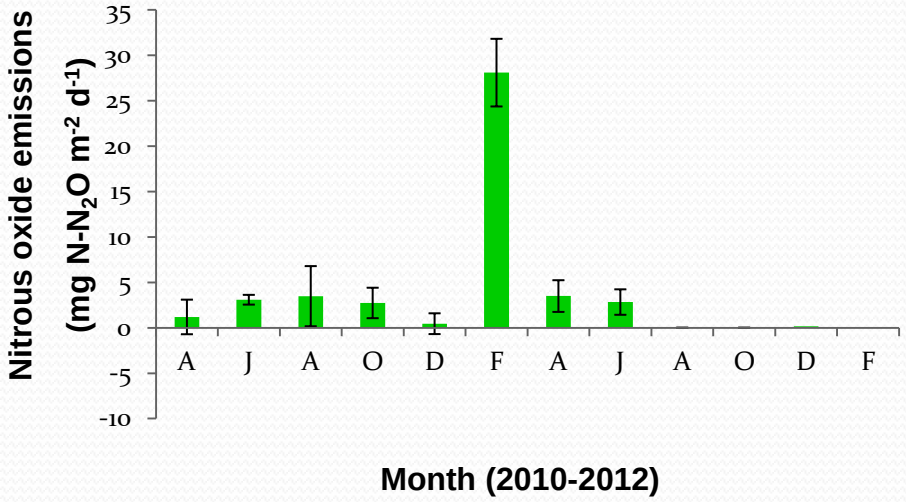
Swamps





Marshes



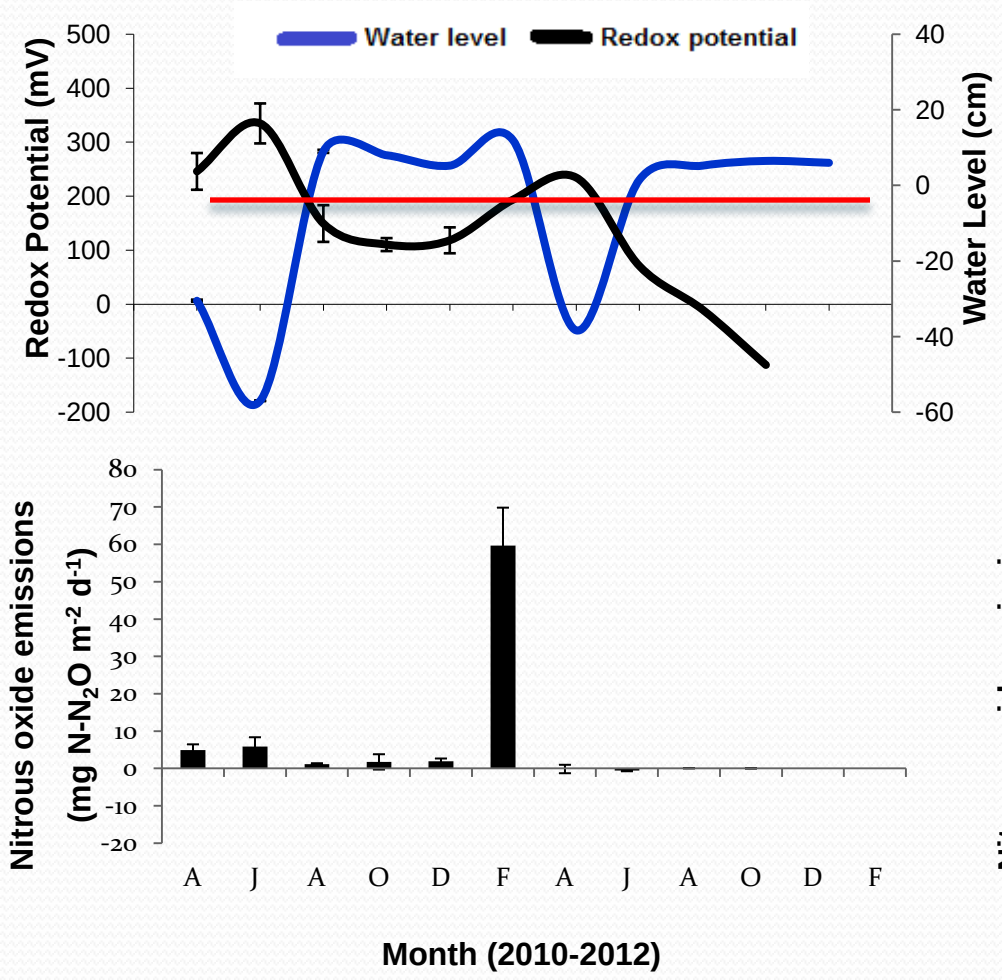


Nitrous oxide emissions in Boquilla de Oro. Values are means (n=4), bars represent atandart error, and letters indicate significant difference at level of $p<0.05$.

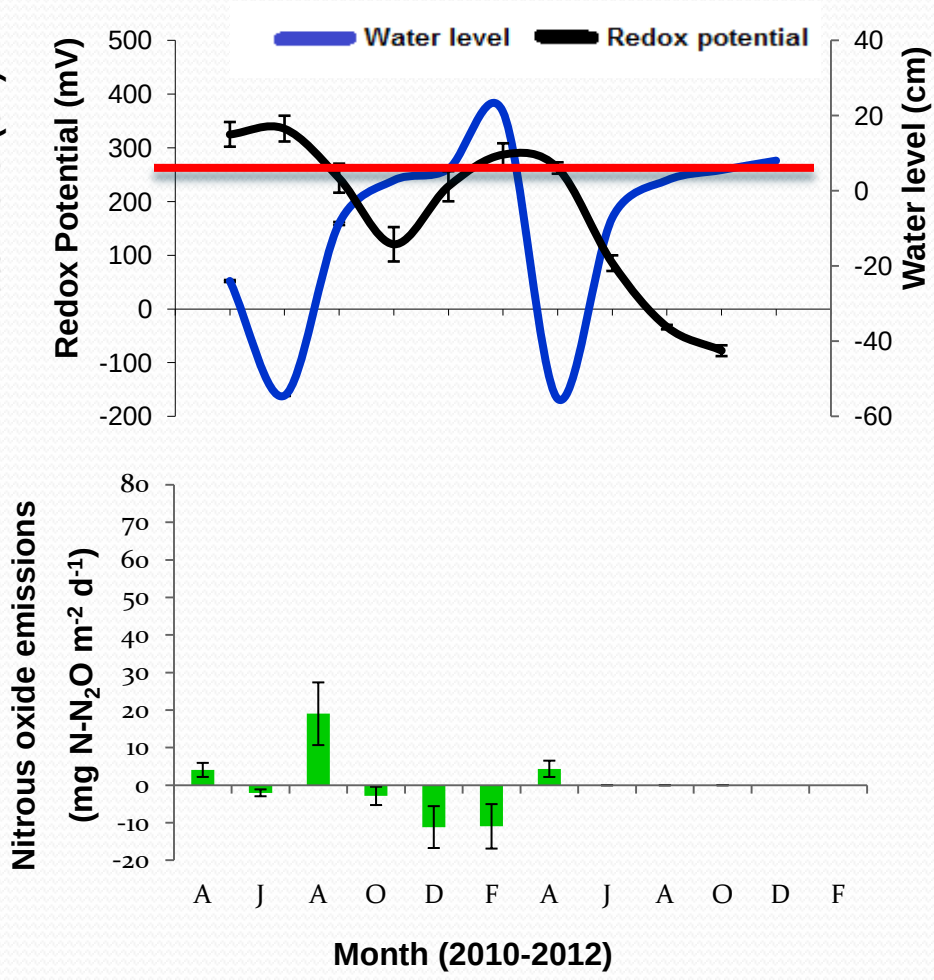
Results cont.

Laguna Chica

Swamps



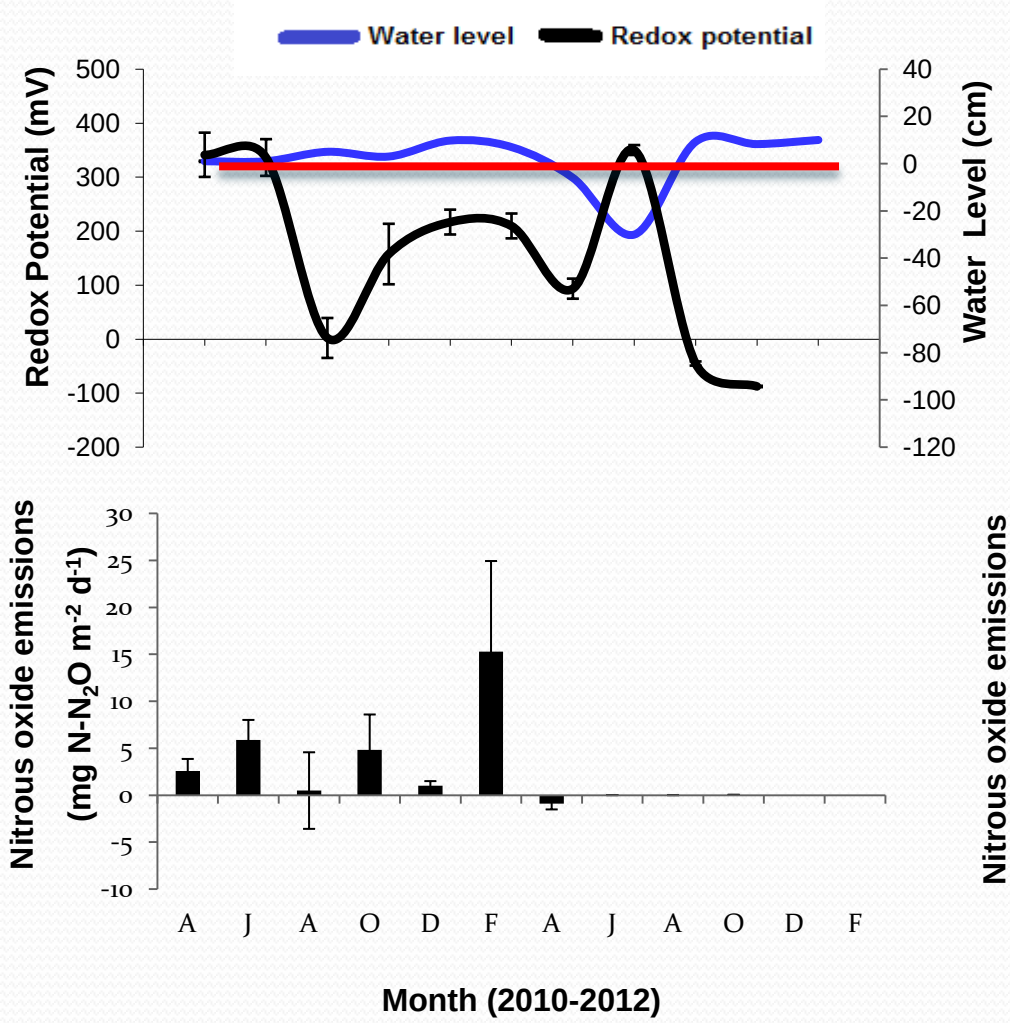
Marshes

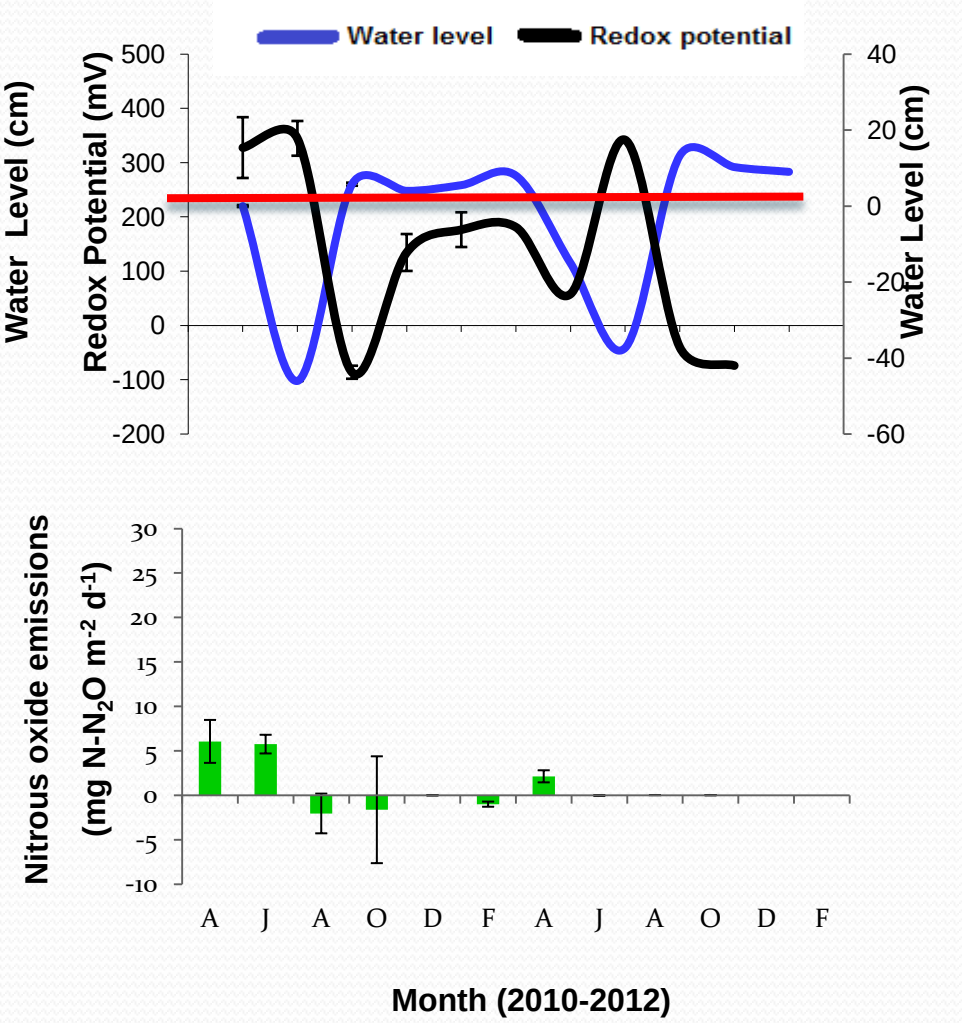


Nitrous oxide emissions in Laguna Chica. Values are means (n=4), bars represent standard error, and letters indicate significant difference at level of $p<0.05$.

Results cont.

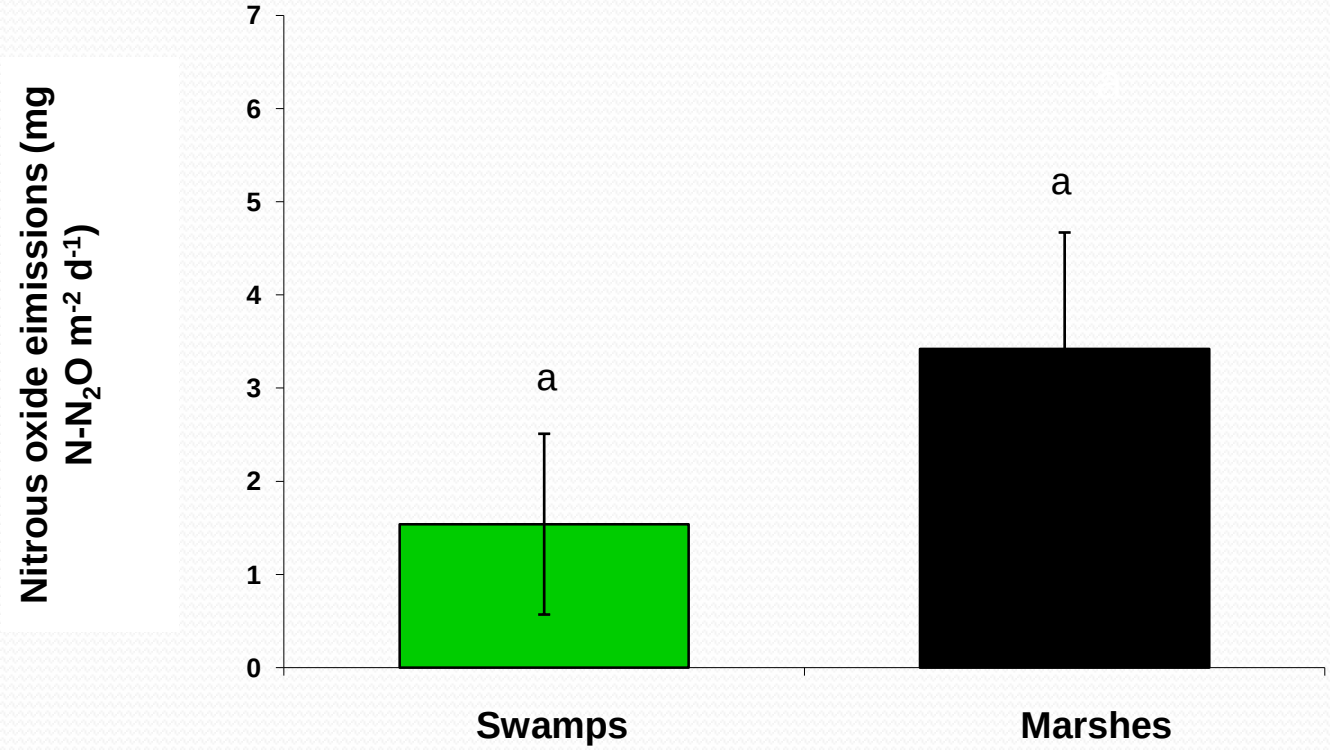
Swamps **Estero Dulce** Marshes





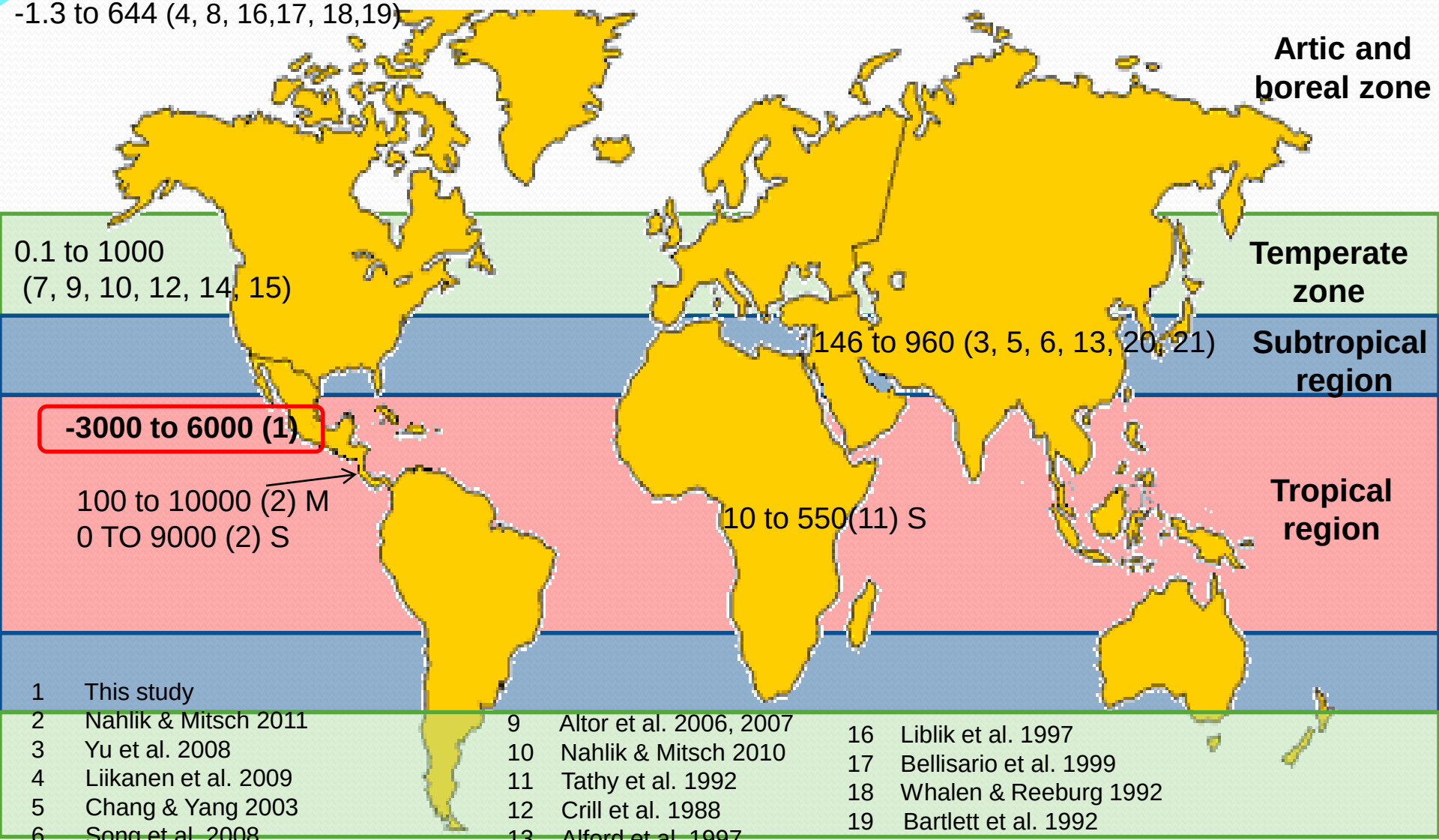
Nitrous oxide emissions in Estero Dulce. Values are means (n=4), bars represent standard error, and letters indicate significant difference at level of $p<0.05$.

Results cont.



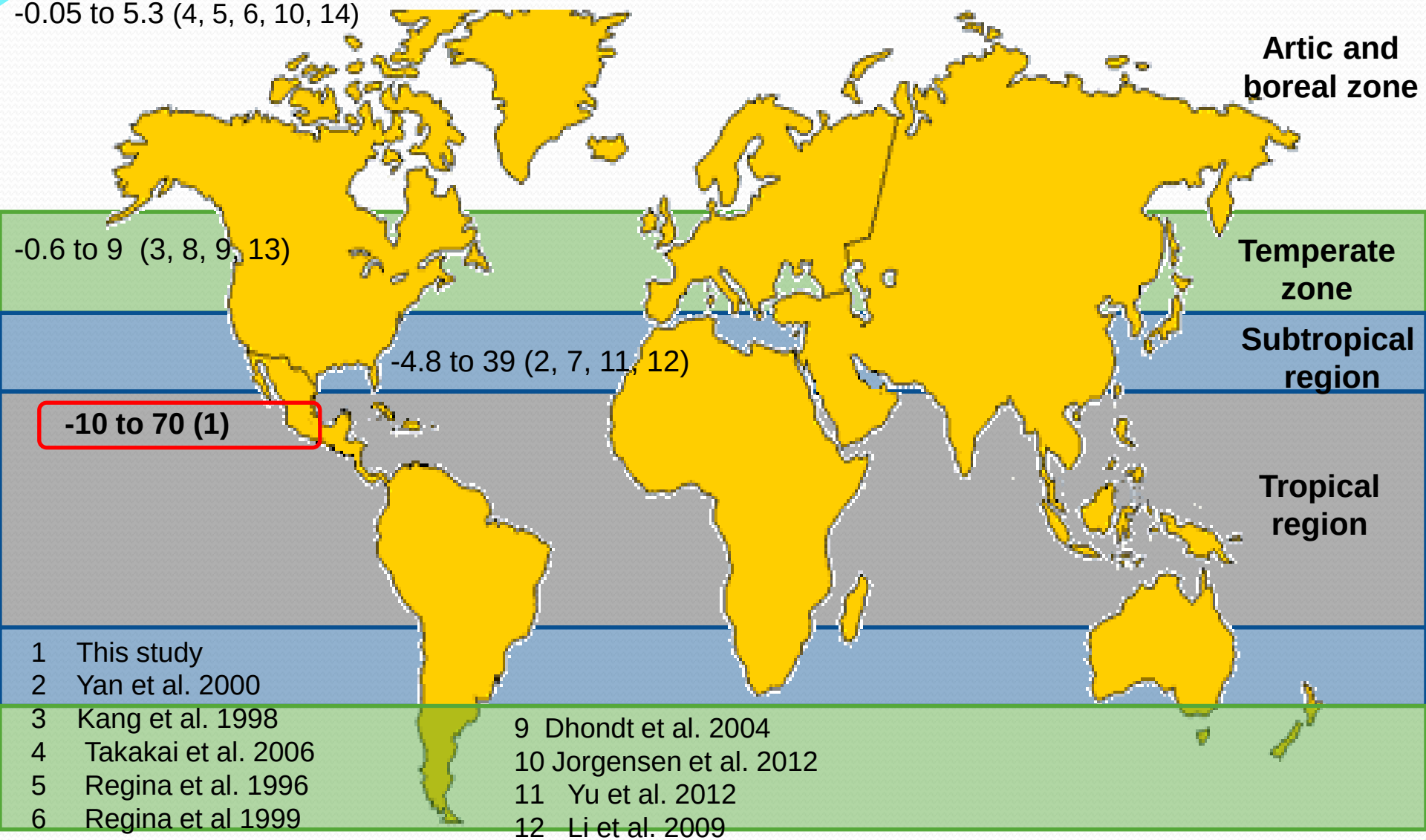
Nitrous oxide emissions in wetlands with different plant community. Values are means (n=144). Bars indicate standard errors. Same letters indicate no significant differences ($p>0.05$).

Methane emissions (mg C-CH_4 m^{-2} d^{-1}) from wetlands in different regions.



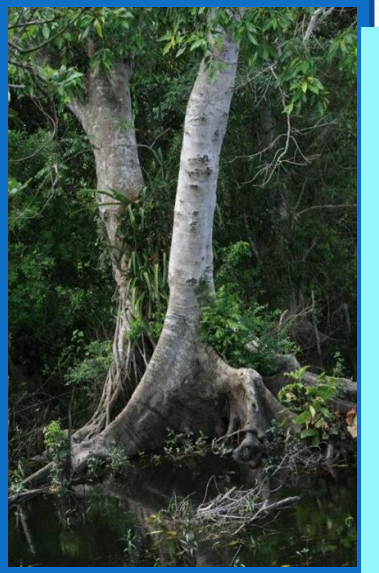
1 This study
2 Nahlik & Mitsch 2011
3 Yu et al. 2008
4 Liikanen et al. 2009
5 Chang & Yang 2003
6 Song et al. 2008
7 Augustin et al. 1998
8 Moore & Knowles 1990
9 Altor et al. 2006, 2007
10 Nahlik & Mitsch 2010
11 Tathy et al. 1992
12 Crill et al. 1988
13 Alford et al. 1997
14 Frolking & Crill 1994
15 Willson et al. 1989
16 Liblik et al. 1997
17 Bellisario et al. 1999
18 Whalen & Reeburg 1992
19 Bartlett et al. 1992
20 Ding et al, 2002
21 Singh et al. 2000

Nitrous oxide emissions (mg $N\text{-}N_2O$ m^{-2} d^{-1}) from wetlands in different regions.



1 This study
2 Yan et al. 2000
3 Kang et al. 1998
4 Takakai et al. 2006
5 Regina et al. 1996
6 Regina et al 1999
7 Yu et al. 2010
8 Agustin et al. 1998
9 Dhondt et al. 2004
10 Jorgensen et al. 2012
11 Yu et al. 2012
12 Li et al. 2009
13 Lu et al. 2012
14 Zhu et al. 2008

Conclusions



- Coastal freshwater marshes and swamps of Veracruz Mexico are sink and source of methane and nitrous oxide.
- There was no significant differences of methane and nitrous oxide emissions between freshwater wetlands with different type of vegetation community.
- Methane emissions in these coastal wetlands increased during rainy and wind season (August to February).
- Nitrous oxide emissions during the study period were variable and did not follow seasonal patterns

Thank you !

FUNDING PROVIDED BY:

SEMARNAT

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eizabeth.hernandez@inecol.edu.mx