Carbon sequestration potential of coastal wetland soils of Veracruz, México

Fuentes-Romero, E, García-Calderón, NE*, Ikkonen, E., García-Varela, KL

*negc@ciencias.unam.mx, fre@comunidad,unam.mx

Universidad Nacional Autónoma de México
Facultad de Ciencias

Unidad Multidisciplinaria de Docencia e Investigación
Campus Juriquilla

1. INTRODUCTION

Tropical coastal wetlands, including evergreen rainforests, mid forest and grassland induced ecosystems play an increasingly important ecological and economic role in the tropical coastal area of the State of Veracruz, México. However, soil processes in these environments, especially C-turnover rates are largely unknown until today (1).

Therefore, we investigated CO_2 and CH_4 emissions together with gains and losses of organic C in the soils of two different coastal ecosystems in the "Natural Protected Area Ciénaga del Fuerte (NPACF)" near Tecolutla, in the State of Veracruz.

2. STUDY SITE

This study was carried out at the Ciénaga del Fuerte, Veracruz , México (20°19´0.76" LN, 96°54´71" LW and 20°18´50.55" LN, 96°52´47" LW; 8 m asl. Tropical humid climate. Vegetation types: Lowland riparian forest, deciduous tropical lowland forest, semideciduos tropical lowland forest, mangrove.

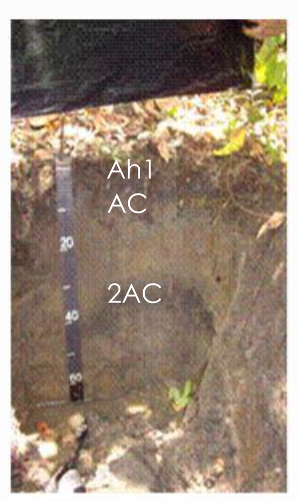
The principal soil groups: Gleysol, Regosol and Cambisol.

Figure 1. Study site in Natural Protected Area Ciénaga del Fuerte (NPACF)"

Semideciduos tropical lowland forest *(S1)*

Grassland flooded (S2)

Figure 2. Soil profiles in tropical wetland



Semideciduos tropical lowland forest *(S1)*

Grassland flooded (S2)

3. MATERIAL AND METHODS

Soil physical (Moisture content, bulk density) and chemical properties such as pH and SOC were determinated.

To measure soil carbon stockes, 2 profiles were digged up to lithic or water table limit (2). Soil samples were taken by genetic horizons. Bulk density samples were extracted with a cylinder of 100 cm³. Additional samples were taken to quantify OC with wet combustion method.

Estimation of CO_2 and CH_4 fluxes *were measured by static chambers installed at the flooded semi-deciduos tropical lowland forest (S1) and flooded grassland (S2) for every season from 2010 to 2011. GHG´s were quantified by gas chromatography. The ecosystem emission compartments were determined.*

GHG´s fluxes measurement

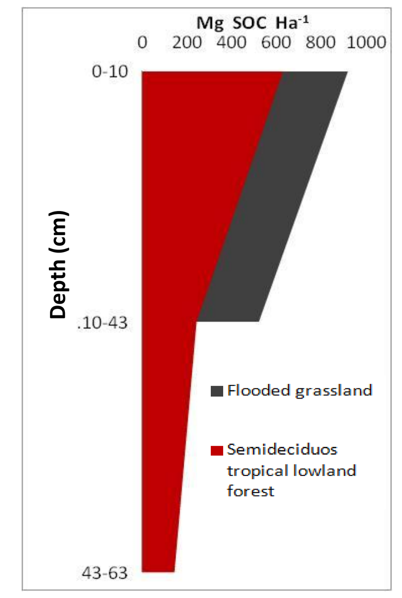
4. Results. Soils showed an accumu… The highest accumulation was obs… content was highest at the subsurface … from slightly acidic to slightly sodic. Low… obtained in the Ah horizons of the flooded g… semideciduos tropical forest.

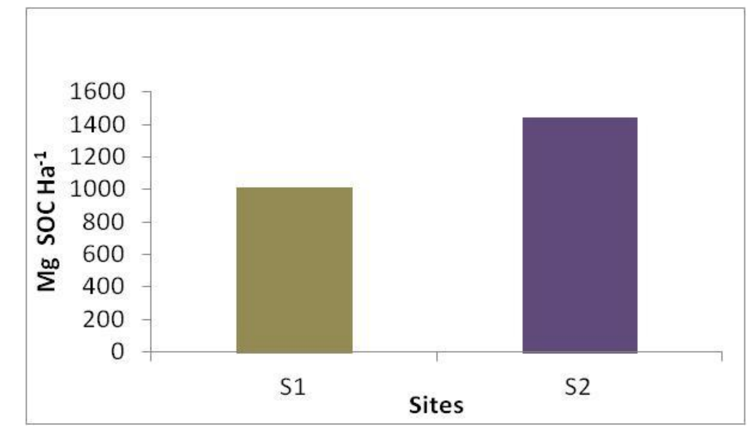
Table 1. Chemical and physical properties of two wetland soils

Sites	Horizon	Depth cm	Color (moist)	Water content w/w	Bulk density g cm⁻³	SOC g kg⁻¹	pH H_2O 1:2.5	pH KCl
Semideciduos tropical lowland forest- 20°19´0.76" LN, 96°54´71" LW; 8 m asl								
S1	Ah_1	0-10	10YR3/1 very dark gray	68.2	0.96	65.5	6.73	6.05
	AC	10-43	10YR3/4 Dark yellowish brown 5YR4/6 yellowish red	25.8	1.50	4.9	7.34	6.17
	Acg	43-63	10YR3/2 very dark grayish brown 5YR4/6 yellowish red	25.6	1.50	4.8	6.52	5.83
Flooded Grassland - 20°18´50.55" LN, 96°52´47" LW; 8 m asl								
S2	Ah1	0-10	10YR3/1 very dark gray	119.4	0.58	159.1	5.3	4.41
	Ah2	10-20	10YR3/1 very dark gray	79.1	0.75	69.8	5.3	5.03

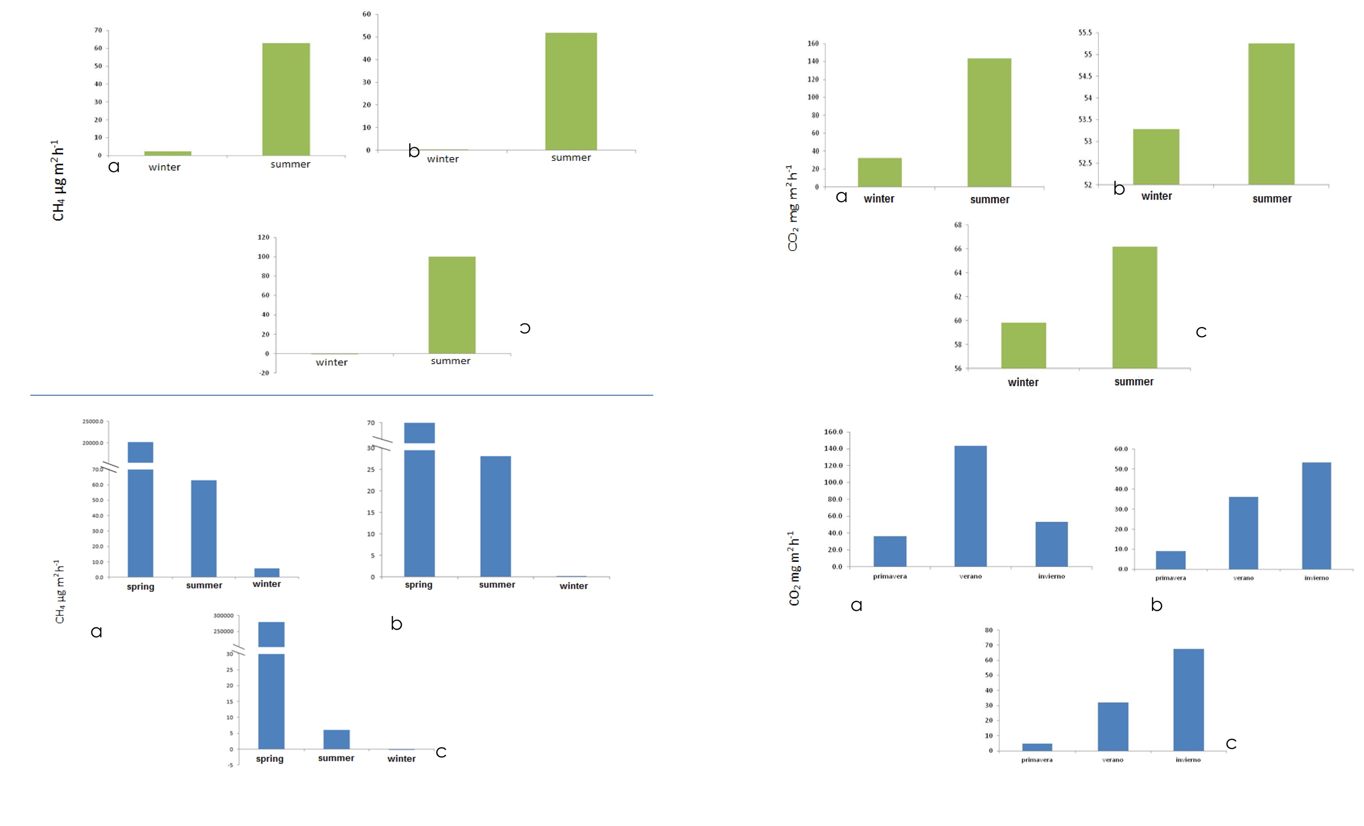
Acknowledgements: Thanks to SEMARNAT-CONACyT project No. 23489 and PAPIIT project No. IN224410 by finantial support

Carbon sequestration on both wetland soil





GHG´s seasonal fluxes of wetland soil



Continuous loss of carbon to the atmosphere occurs at both sites during spring and summer. But during the rainy season the emission is less for CH_4.

5. Discussion and conc…

Soil organic carbon accum… showing its stability by edaphogenic proces… grassland and humification in the forest), altho… bution in the soil, especially in the forest. OC accumulat… the pasture than in the forest, although both had a high potentia… bon budgets. This has been associated with high input necromass from the root system and canopy biomass residues (3). The budgest C in the tropical forest is greater than 360 Mg Ha⁻¹ reported in other soils (4). The budgest C potencial is similar a another areas .

Carbon balance in both systems is given by the loss of C to the atmosphere on a continuous basis, especially the grassland that emit similary to other (4). Although there is a significant reduction in CO_2 and CH4 emissions during the winter season. This is associated with temperature and humidity changes. It is documented by several authors that in wetland soils production of CH_4 and CO_2 are influenced by soil humidity and soil temperature (4). The grassland emission GHG´s is greater than other systems reported (5).