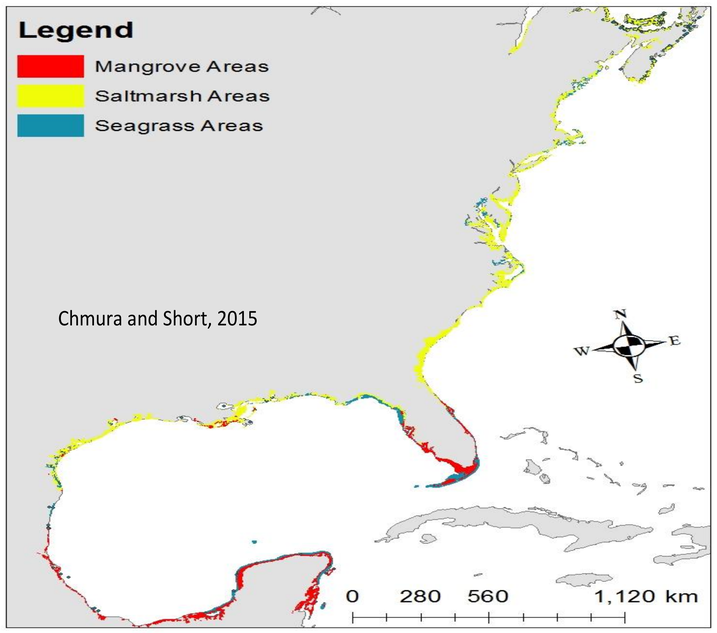
Stock and Extent of Blue Carbon in Gulf of Mexico: Mangroves, Salt Marshes, Seagrasses, River inflow

Thorhaug, A*, HM Poulos*^, RG Najjar+, M. Herrmann+, J Lopez-Portillo#, J Barr, TC Ku^, GP Berlyn***

- *Yale School of Forestry,. ^ Earth Sciences Wesleyan Univ.,+ Dept. Oceanography, Penn. State Univ., INECOL, Xalapa, Mx, **Everglades Nat'l Park,

Gulf of Mexico Watershed



*Need improved estimates of "North American coastal ocean and continental margin air-sea fluxes, **land-ocean and coastal open ocean exchange, and biogeochemical cycling** ...to close the carbon budget over North America" Doney (2004)*

Acknowledgements

- Commission for Environmental Cooperation N. America
- Kempner Foundation
- Mitchell Foundation
- Dept of Interior,
- NASA
- ConaBIO, Inecol, Mx
- Seagrant NOAA
- US Fish and Wildlife Program

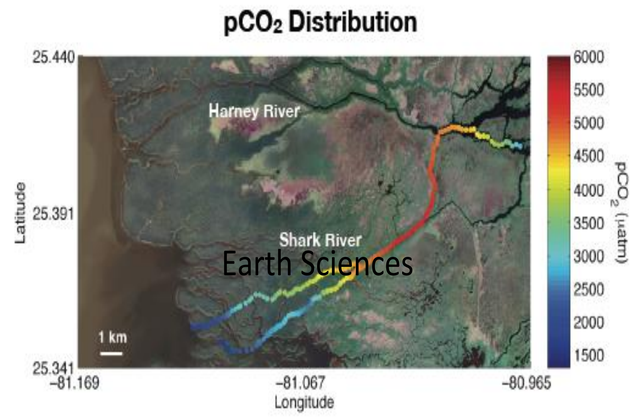
Habitat Of Carbon	Total Extent GOM ha	Corg Mg /ha	Stock in GOM Tg C
Terrestrial C flux Riverine (from Buttman 2013)	GOM=26 Atl=15.4	*GOM=19 ATL.=17*	
Salt marshes (Hansen & Nestlerode;Moss, 2016)	432600	226.5-313*	98-135.4
Mangrove (Barr et al 2016; Lopez-Portillo2017)	538246	386-1356^ (1008)	207.8-1118.5
Seagrass (Thorhaug et al 2017	947600	179*	169.6
Total Blue carbon	1,918,446	791.5-1848	475.4-1423.5

Emerging role of mangroves & seagrasses in estuaries

- Mangrove forests are major contributors of blue carbon to the coastal ocean especially South Florida & Mexico .

- 1) high rates of productivity and suppressed respiration,
- 2) adjacency to the oceans
- 3.)Intensive biogeochemical exchange.

Example of Carbon Flow: Mangrove Shark River, FL (Barr et al)



Map showing distributions of pCO_2 during SharkTREx 1. The pCO_2 data have been corrected for tidal movement to slack water before ebb according to the method described in *Ho et al.* [2002], so represents the most upstream distribution.

Mangroves East GOM Major carbon budget terms

Carbon term	Description	Values ($g\ C\ m^{-2}\ y^{-1}$) *During 2004 to 2013*	As a fraction of -ΣNEE
Net ecosystem exchange (-ΣNEE)	Net transfer of CO_2 from atmosphere to ecosystem	1016 ± 232	
Net primary productivity (NPP)	Litter fall, above and below ground production	762 ± 164	75%
Soil carbon	Accumulation of new carbon in the soil	225 ± 61	22%
Carbon export (DOC, DIC, POC), **version 1**	Export = -ΣNEE - NPP	254 ± 379	**25%**
Carbon export (DOC, DIC, POC), **version 2**	Export = -ΣNEE – Soil carbon	791 ± 293	**78%**

$$NECB \cong -\sum NEE + F_{DIC} + F_{DOC} + F_{PC}$$

$$-(F_{DIC} + F_{DOC} + F_{PC}) = Export = -\sum NEE - NECB$$

Data Sources:
–ΣNEE: Barr, Fuentes, Engel (SRS6 flux tower), **Leaf litter**: V. Rivera (FCE LTER), **Wood**: Castaneda et al., 2013, T. Smith, **Roots**: Castaneda dissertation, **Soil carbon**: Breithaupt et al., 2014