

# Estuarine Fluxes Report

**Gulf of Mexico Coastal Carbon Synthesis Workshop**

*March 27-28, 2013*

*U.S. Geological Survey, St. Petersburg, FL*

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**Co-leaders:** Chris Osburn (NC State University), Maria Herrmann (NASA), Tom Bianchi (Texas A&M)

**Team members:** Ron Benner (University of South Carolina), Cedric Fichot (University of South Carolina), Jennifer Cherrier (Florida A&M University), Paul Montagna (Texas A&M University Corpus Christi), Chris Smith (USGS-St. Petersburg)

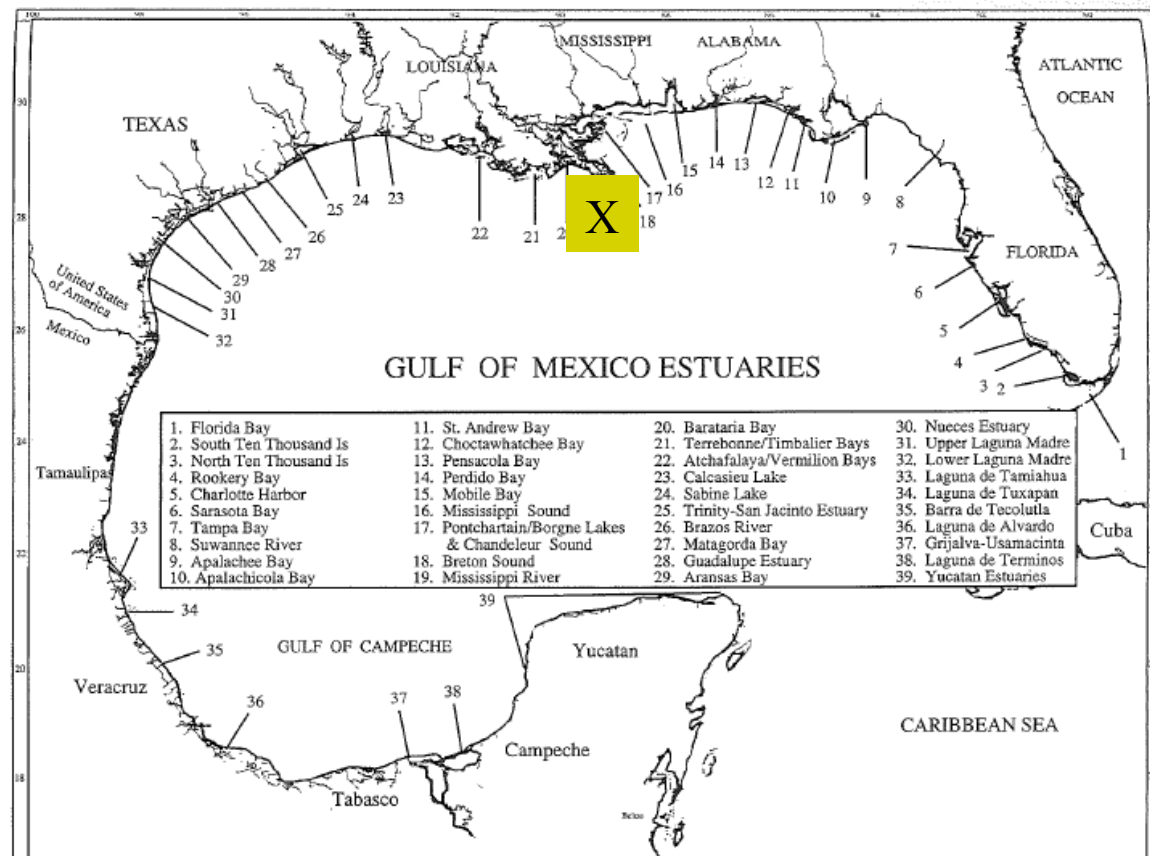


# The estuarine “purview”

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- Land-ocean interface not including an extended estuary, e.g., the Mississippi River
- Estuaries proper, coastal wetlands, tidal freshwater wetlands
- Water column and sediment-water exchanges
- The inner shelf
  - river/estuarine mouth/pass to 200 m isobath

# The estuarine “purview”



Bianchi et al. (1999)

# Estuarine diversity & classification

A. Ecological - Geochemical Matrix

	Herbaceous (marsh)	Forested (mangrove)
Terrigenous-clastic based system	Barataria Basin Fourleague Bay	Boca Chica
Carbonate based system	??????	Estero Pargo Rookery Bay Taylor R., Shark R.

B. Ecological - Geomorphological Matrix

	Herbaceous (marsh)	Forested (mangrove)
Wetlands proximal to open estuary	Barataria Basin	Boca Chica Estero Pargo Rookery Bay (fringe)
Wetlands proximal to other wetlands	Fourleague Bay	Shark River Taylor River Rookery Bay (basin)

C. Watershed Coupling - Geochemical Matrix

	Intensive upstream, downstream coupling	Minimal upstream, downstream coupling
Terrigenous-clastic based system	Fourleague Bay Boca Chica	Barataria Basin
Carbonate based system	Shark River	Taylor River Estero Pargo Rookery Bay

D. Ecological - Watershed Coupling Matrix

	Herbaceous (marsh)	Forested (mangrove)
Intensive upstream, downstream coupling	Fourleague Bay	Boca Chica Shark River
Minimal upstream, downstream coupling	Barataria Basin	Estero Pargo Rookery Bay Taylor River

(a)

Bianchi et al. (1999)

# Non-conservative processes in GMx estuaries

- River flux estimates through these estuaries need some consideration of source and/or sink
- Variability over seasons and across estuarine types

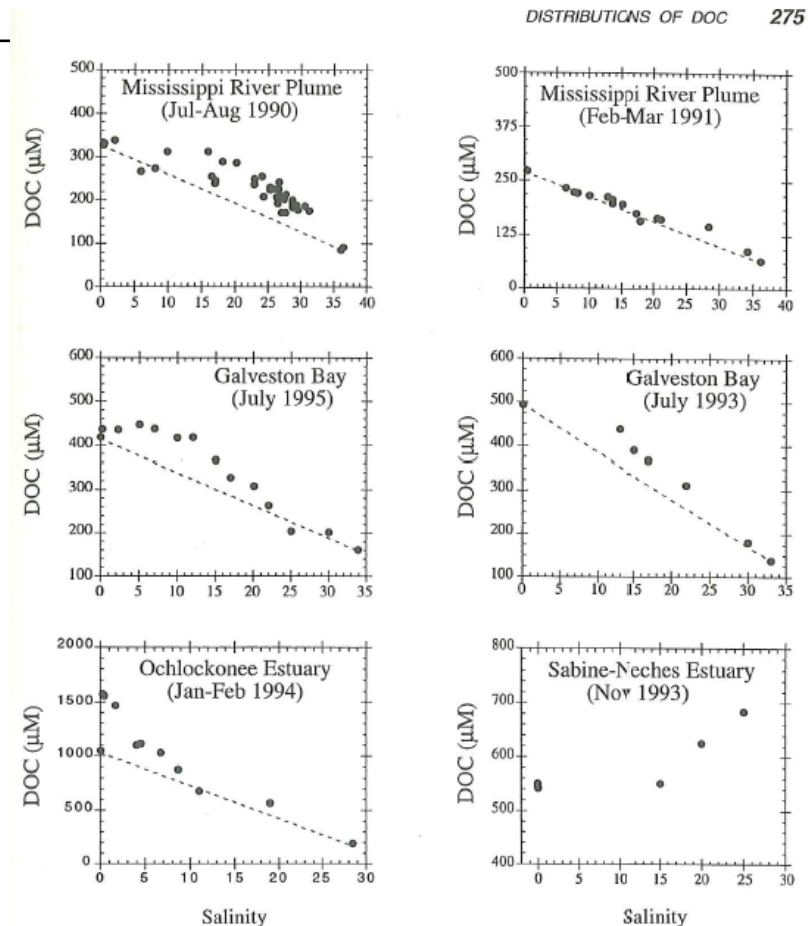
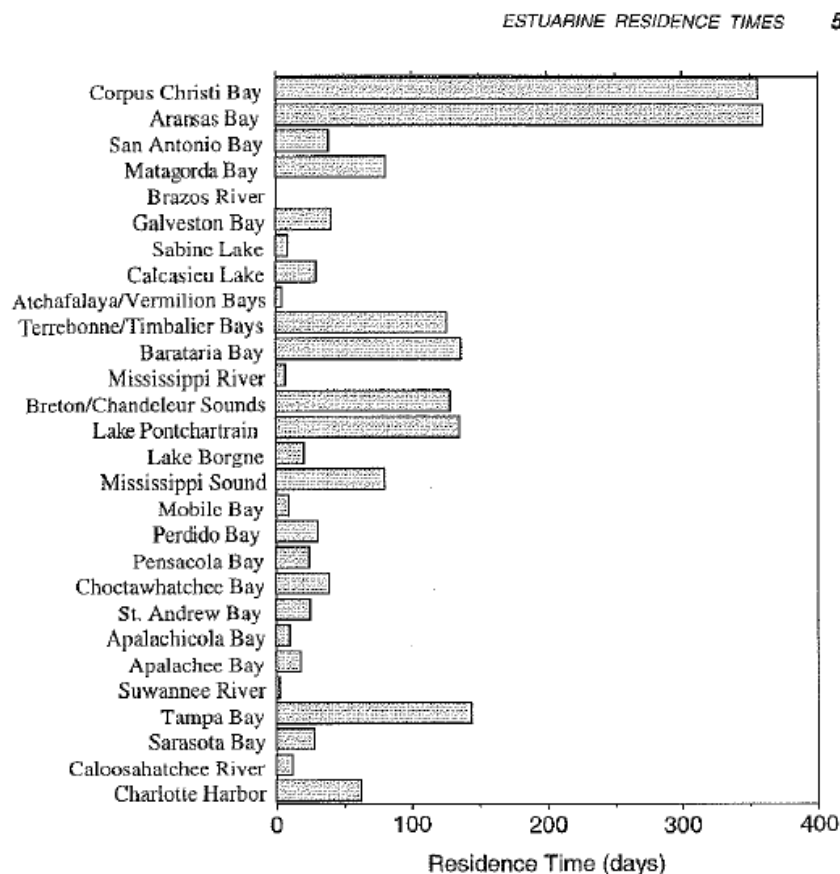


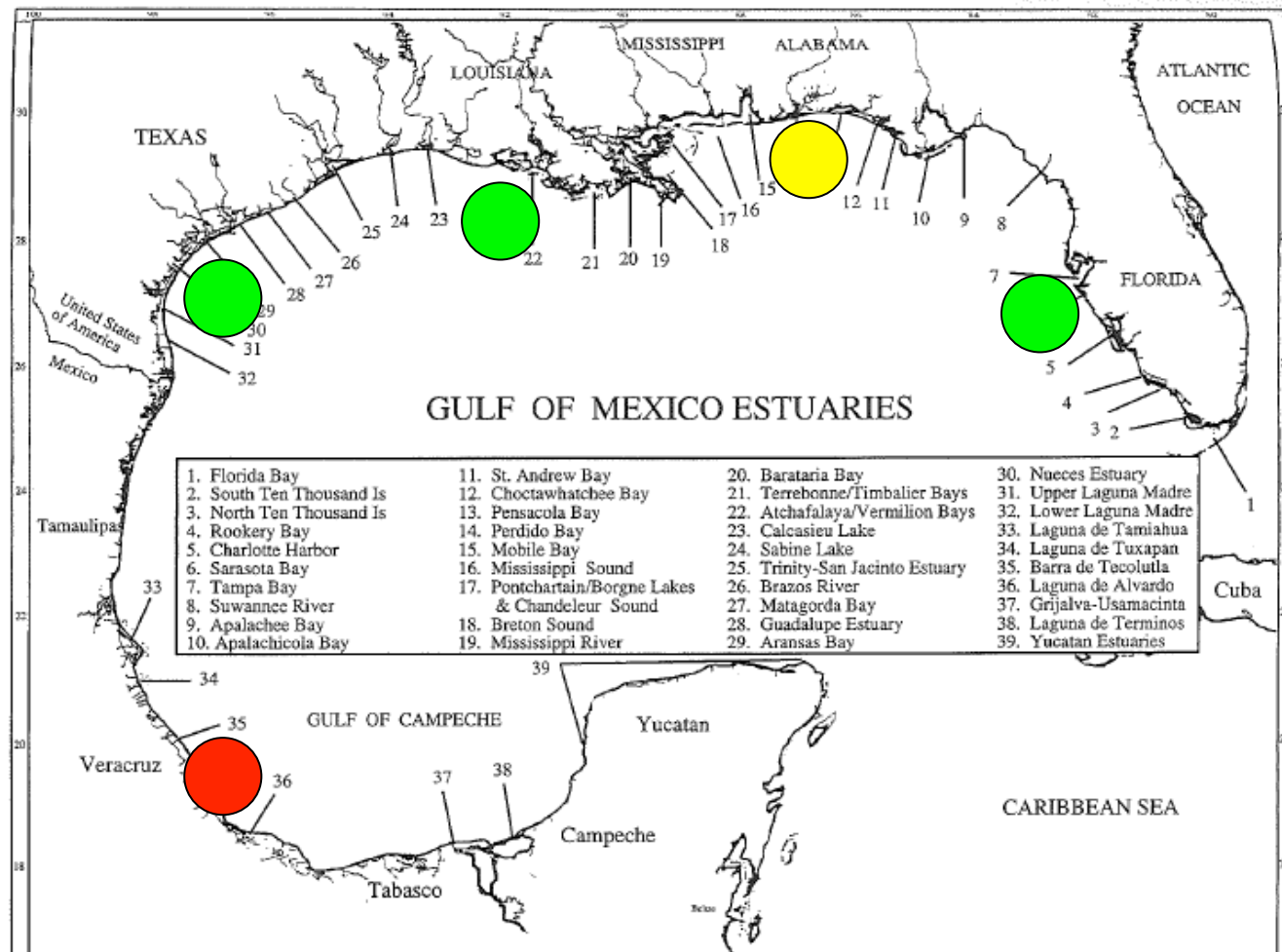
FIG. 9-3. Behavior of DOC during estuarine mixing from selected Gulf of Mexico estuaries (plotted from data in Stordal et al. (1996a) for the Sabine-Neches Estuary and from Powell et al. 1996 for the Ochlockonee estuary; modified from Benner et al. 1992a for the Mississippi River plume and from Guo and Santschi (1997a) for Galveston Bay).

# Variability with respect to residence time



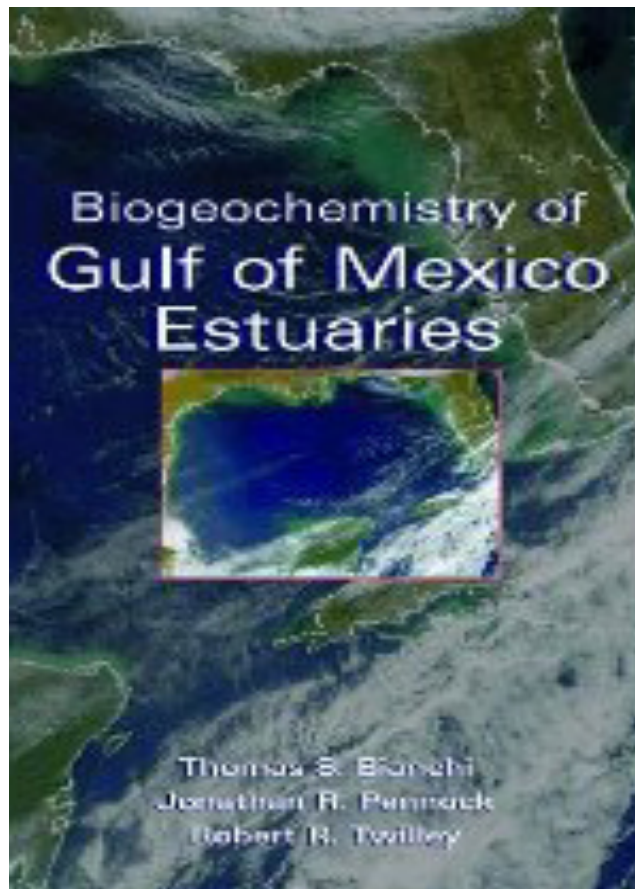
- Large gradients
- These will influence the internal C cycling
- River fluxes may be less accurate
- Take a limnological approach
- Determine unifying theme

# Assessment of coverage



# Data Sources

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- ❑ Key POC and DOC data
- ❑ Includes estuarine, riverine, wetland information
- ❑ Flux estimates
- ❑ Starting point for synthesis





# Data Sources

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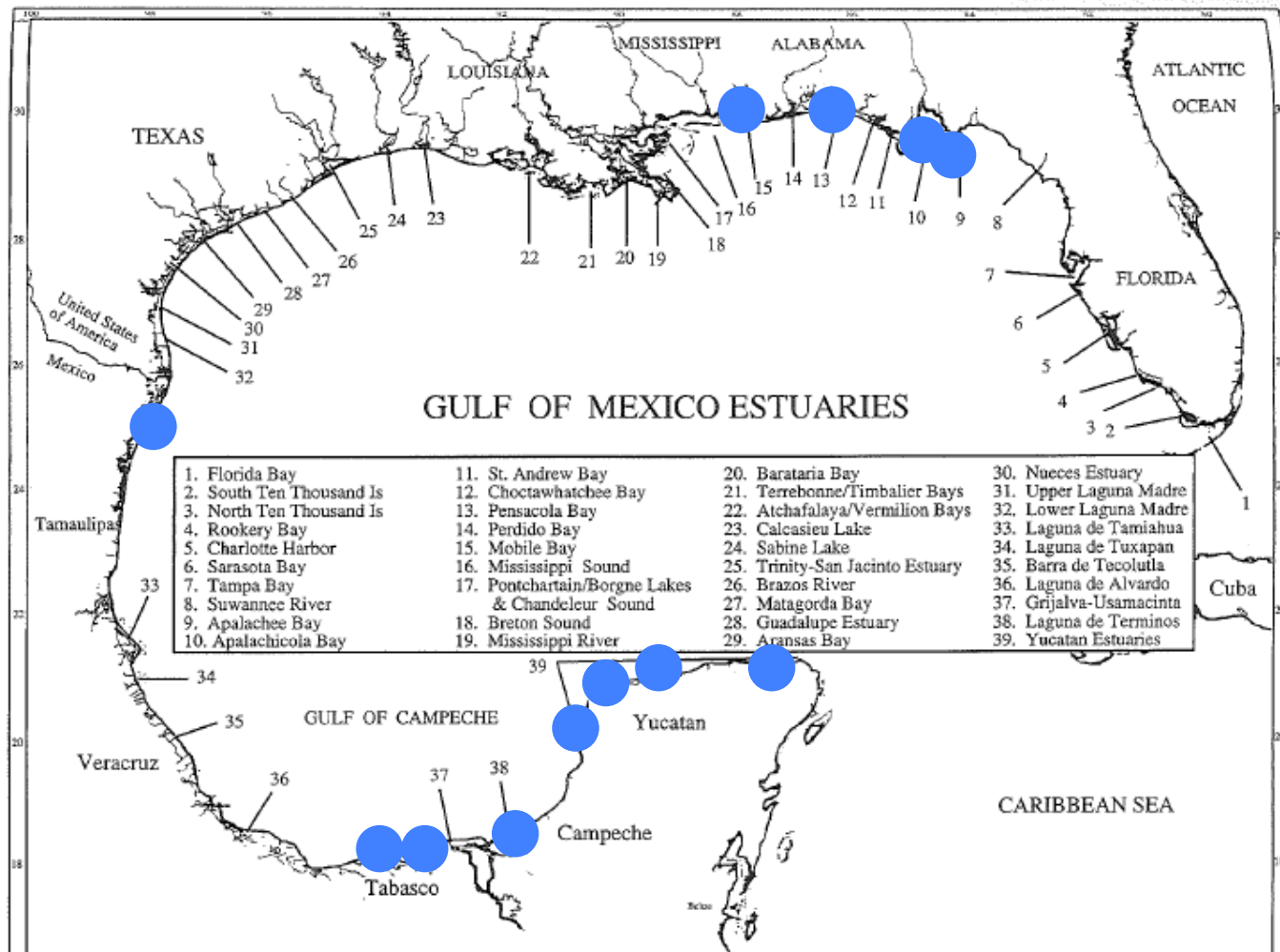
## □ Estuaries

- Bianchi: LA and TX estuaries (e.g., Sabine-Neches, Lake Pontchartrain, Barataria)
  - POC and DOC
- Montagna: Laguna Madre, central TX coast
  - TOC

## □ Inner shelf

- Benner: all shelf to 200 m
  - POC and DOC, CDOM
- Osburn: BCO-DMO database
  - CDOM and DOC

# LOICZ NEP flux estimates





# Modeling the fluxes

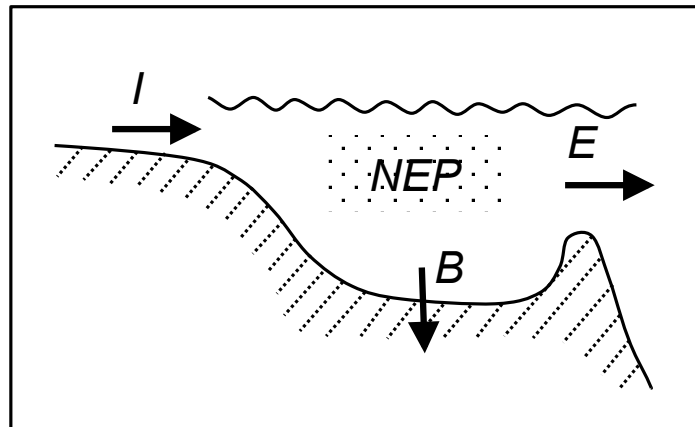
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- The goal is a linked physical-biogeochemical model
  - Mike Kemp proposed East Coast approach to the group
- Available physical (circulation) models
  - Estuarine – state agencies (GOMA?)
  - Coastal/shelf – HYCOM, NCOM
- Link together River – Estuary – Shelf
- Match-up to circulation models
  - Offshore 30 km from PASS
  - Hycom into PASS
  - PASS could be the focus

# East Coast Approach to OC Fluxes

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- Statistical approaches to constrain:
  - Net ecosystem production ( $NEP$ )
  - Carbon burial ( $B$ )
  - Riverine input ( $I$ )
- Export ( $E$ ) estimated by difference assuming steady state





# Advantages of applying the East Coast approach to the Gulf of Mexico

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- Both regions have similarly local estuarine variability
  - Marsh systems
  - Lagoons
- Unify C fluxes in two coastal plain passive margin systems
- Geographical comparisons of estuaries are rarely done
- A more comprehensive study places estuaries in the larger global context



# Data uncertainty

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- ❑ Coastal marshes along FL panhandle to AL
- ❑ Tidal marshes fringing estuaries
- ❑ Wetlands
- ❑ Benthic fluxes in estuaries
- ❑ Subsidence in LA estuaries



# Summary

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- We are continuing to gather C flux numbers
- We advocate for taking the East Coast estuarine flux approach as a starting point
  - with appropriate caveats
  - integration with the East Coast group
- Advocate for coupling estuarine and coastal circulation models