SPATIAL AND TEMPORAL VARIATIONS OF CARBOHYDRATE SPECIES IN THE NORTHERN GULF OF MEXICO

Kusumica Mitra
Dr. William (Monty) Graham
The University of Southern Mississippi
The Department of Marine Science
Stennis Space Center

Background information

- Masters student; The University of Southern Mississippi.
- Major: Chemical Oceanography.
- Masters thesis on carbohydrates, acidic polysaccharides, dioxin in rivers and coastal water in the Northern Gulf of Mexico.

Mentor's information

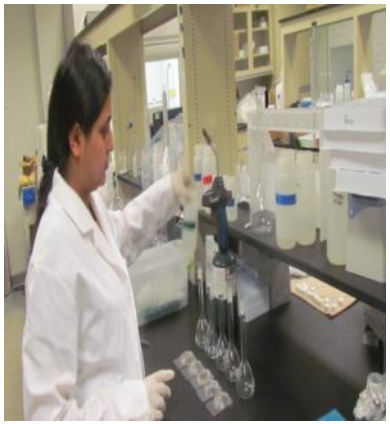
- Mentor: Dr. William (Monty) Graham.
- Chair and Professor of DMS/USM.
- Research interest: marine zooplankton ecology, climate change in river dominated system, long term ecosystem dynamics.

What I did

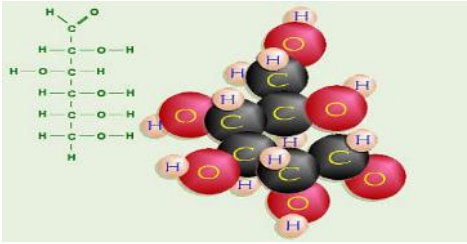
- Data processing and interpretation of carbohydrate samples collected and analyzed from a previous NGI project.

- APS analysis.

Sample processing and analysis



Introduction



- DOC : largest organic carbon reservoir in the ocean; composed of CHO, protein, lipids and others

- CHO: major focus; CHO: C, H, O; (CH_2O), present in both dissolved and particulate phases.

- Dissolved carbohydrate (d-CHO): A major component of DOM (10-85%), including monosaccharide (MCHO) and polysaccharides (PCHO).

- Particulate p-CHO.

Why carbohydrates (CHO)?

- structural component
- energy storage in living cells
- indicator of the bioreactivity and diagenetic state of both DOM and POM.
- plays an important role in the carbon budget and its biogeochemical cycling

Sources and Sinks

- Sources:
  - Phytoplankton
  - Bacteria
  - organic matter decomposition
  - river run-off or terrestrial organic matter
  - sediment resuspension
- Sinks:
  - Biological uptake, decomposition
  - Coagulation

Acid Polysaccharides (APS)

- Neutral and charged CHO
- Produced by marine algae and bacteria
- Trace metals scavenging; bioavailability and toxicity
- Important in humic acid formation
- Very little work done in the Northern GOM.

Significance of the study

- Scarce p-CHO, APS data in the literature for the northern GOM.

- First dataset for the Mississippi Sound/Bight

Objectives

- To examine the partitioning and distribution of dissolved and particulate carbohydrate and APS along a salinity gradient.

- To determine the seasonal variations of CHO in the Mississippi Sound/Bight.

- To determine major factors controlling the dynamics of carbohydrates in the study area.

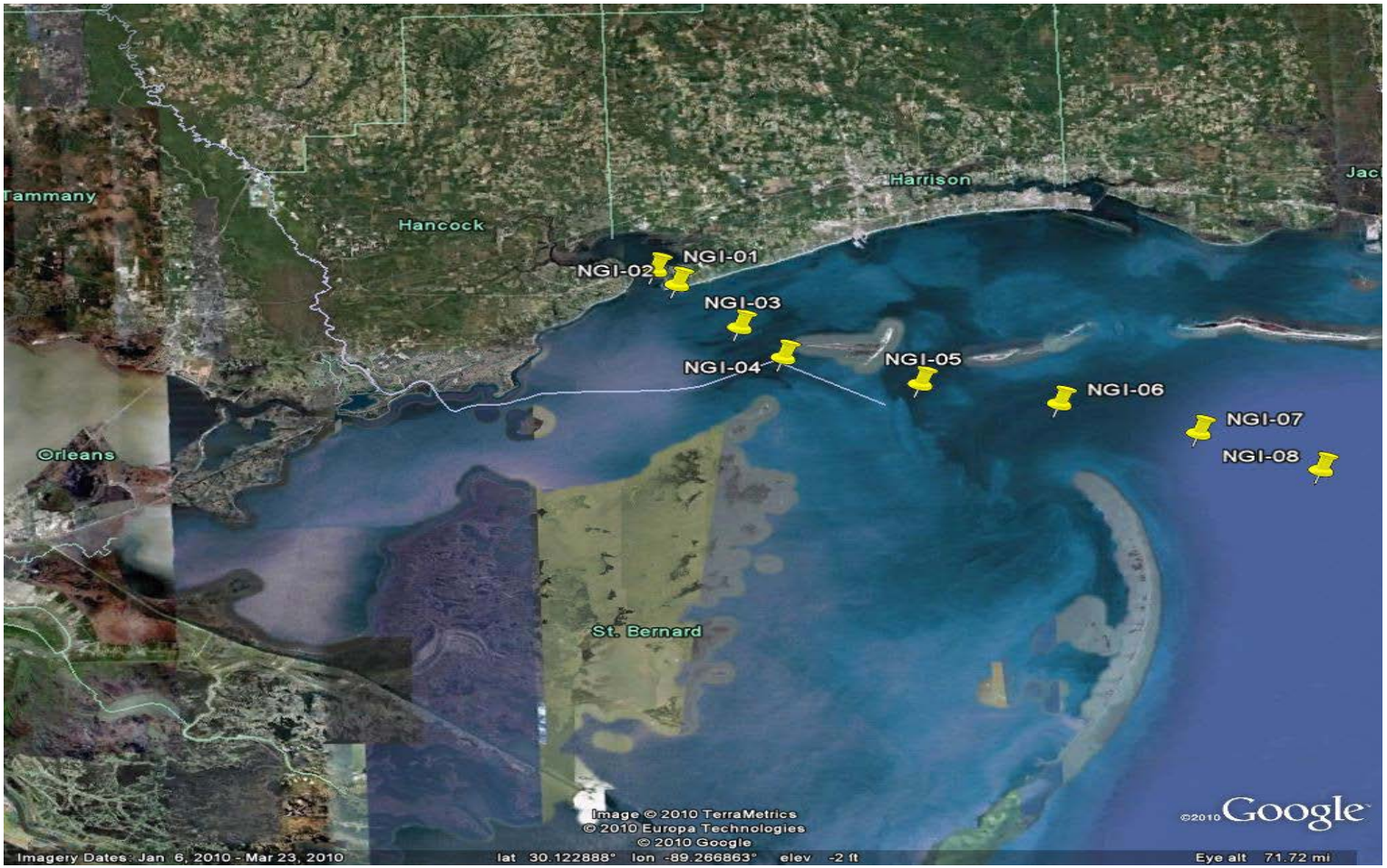
Methods

- DOC
  - high temperature combustion method using a Shimadzu TOC-V analyzer.
- CHO measurements
  - TPTZ (2,4,6-tripyridyl-s-triazine) (Wang et al., 2010).
- POC, SPM, nutrients and Chl-a

  Mojzis (2011); Guo and Santschi (1997);
- APS (particulate)

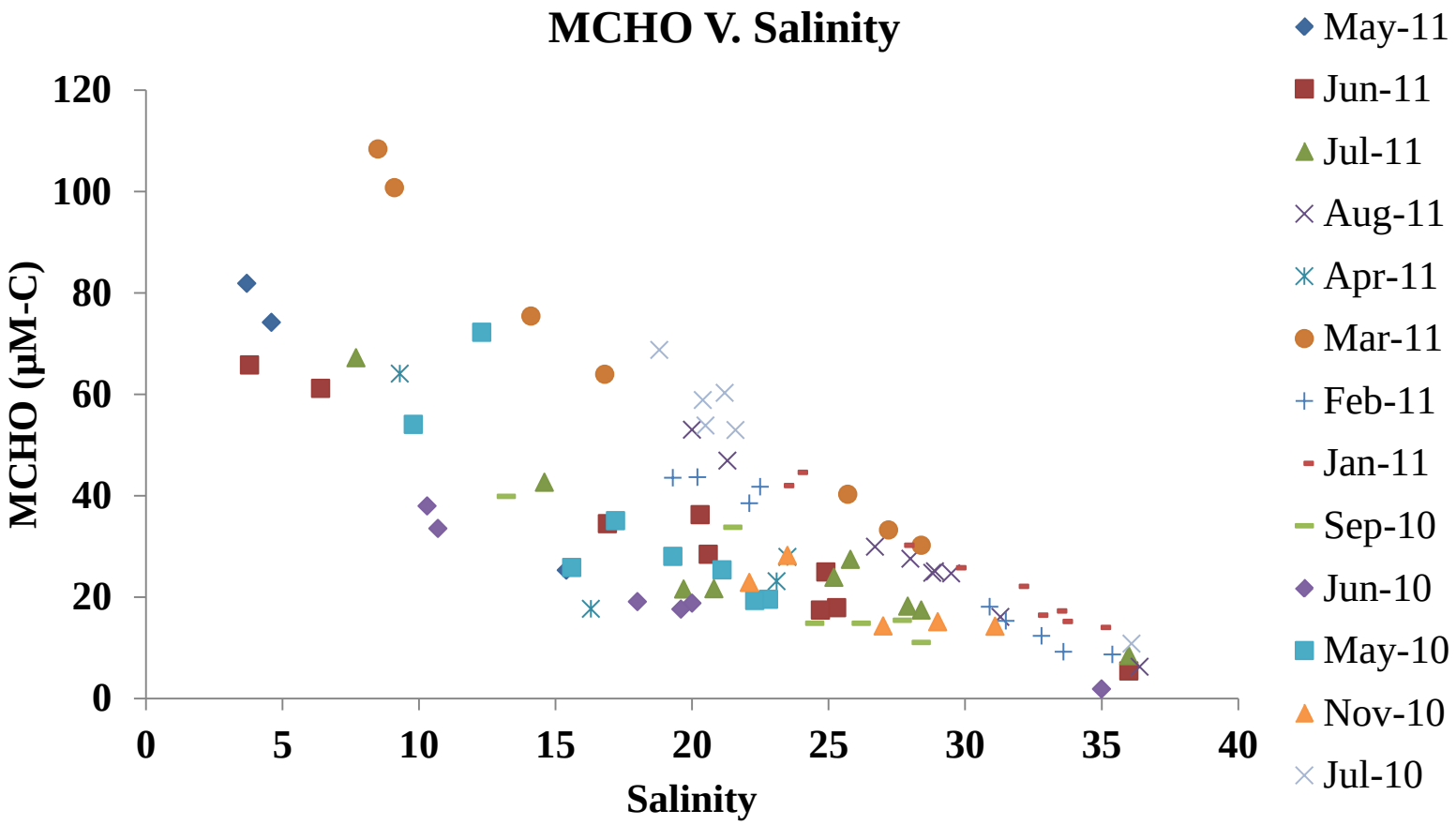
  - alcian blue method/80% sulfuric acids/878 nm (Hung et al, 2010; Xu et al., 2011)

Sampling sites



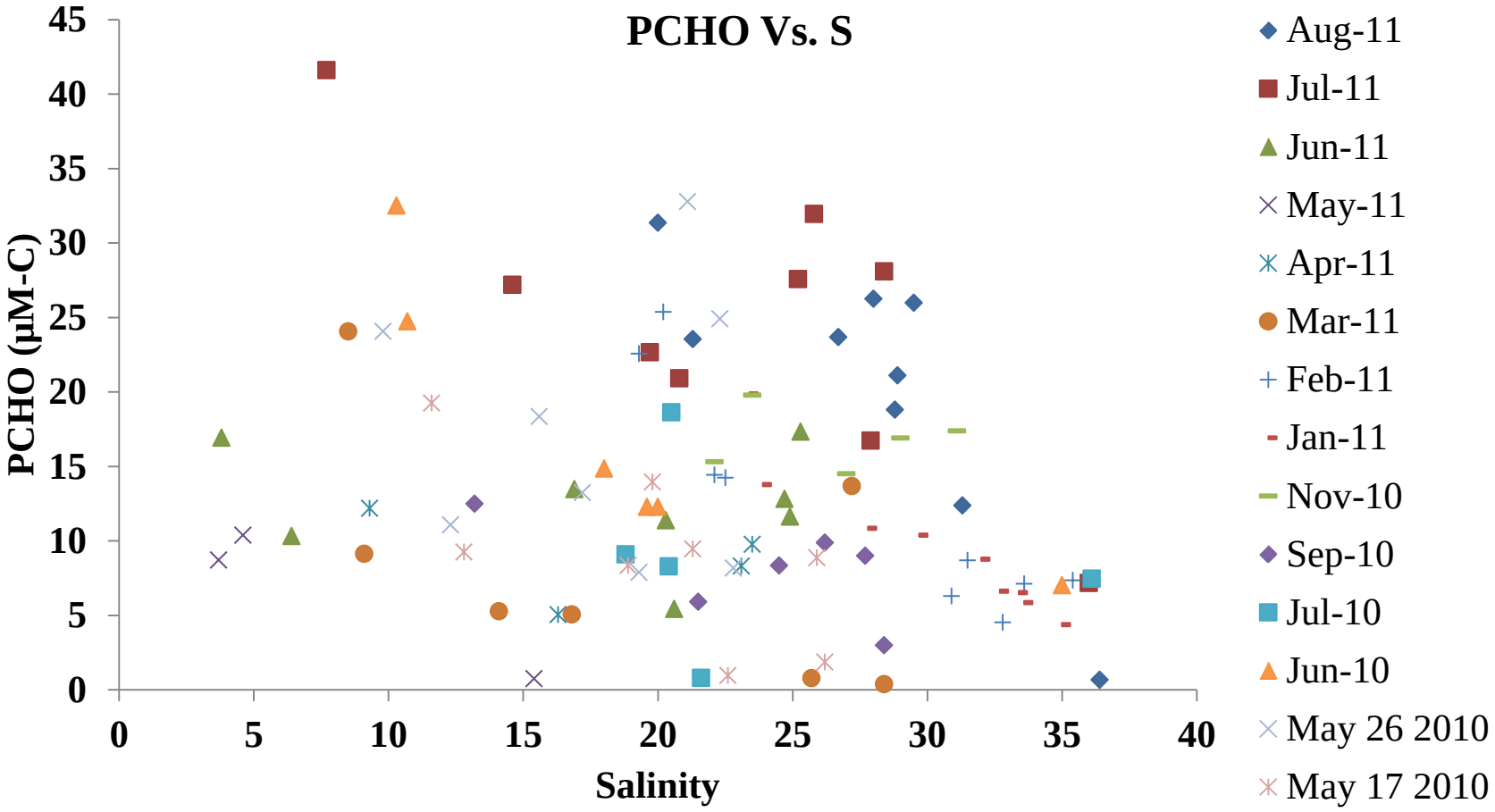
Sampling stations along a transect from near-shore to offshore in the Mississippi Sound/Bight.

Monosaccharides



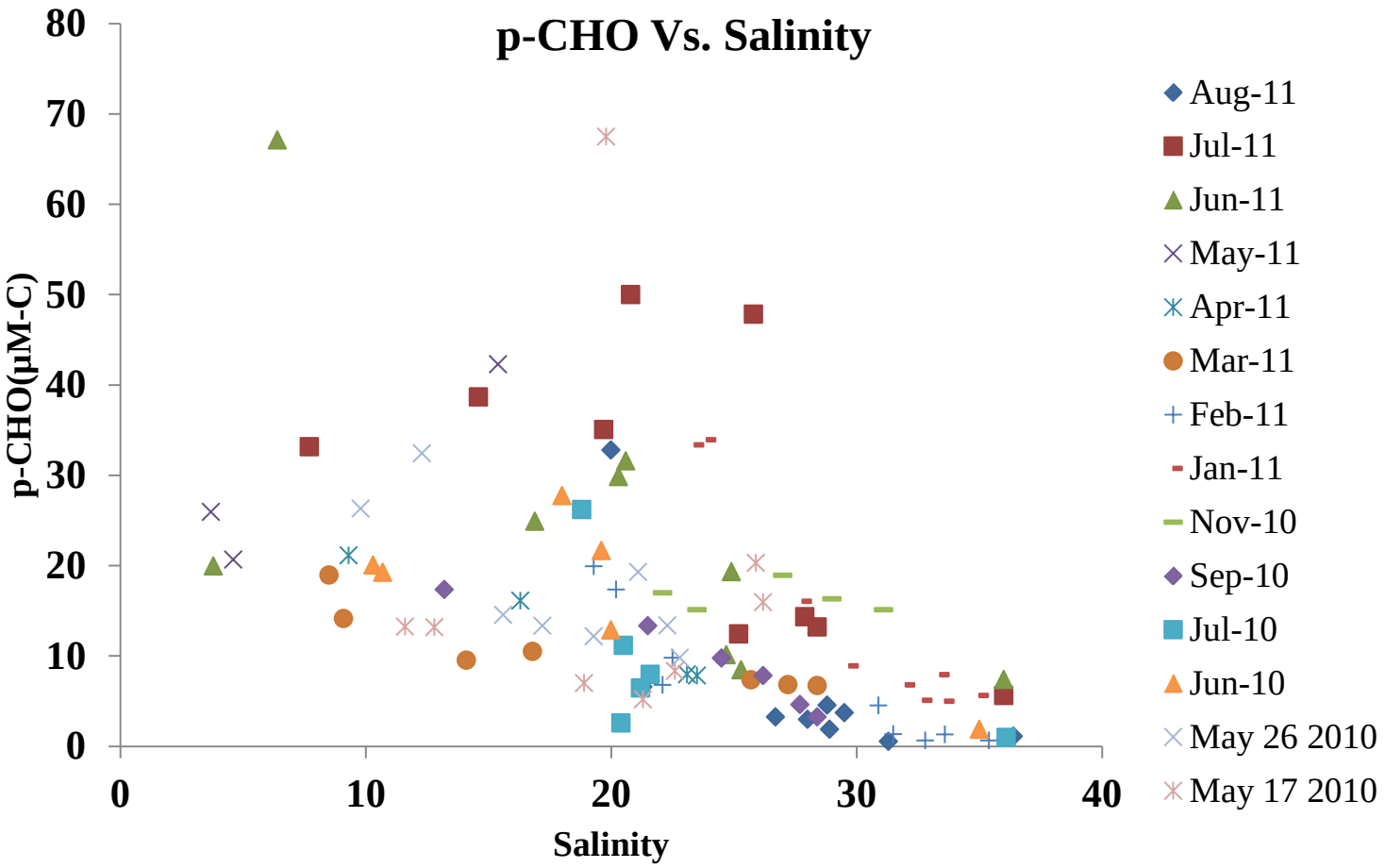
Showing a riverine source and somewhat conservative

Polysaccharides



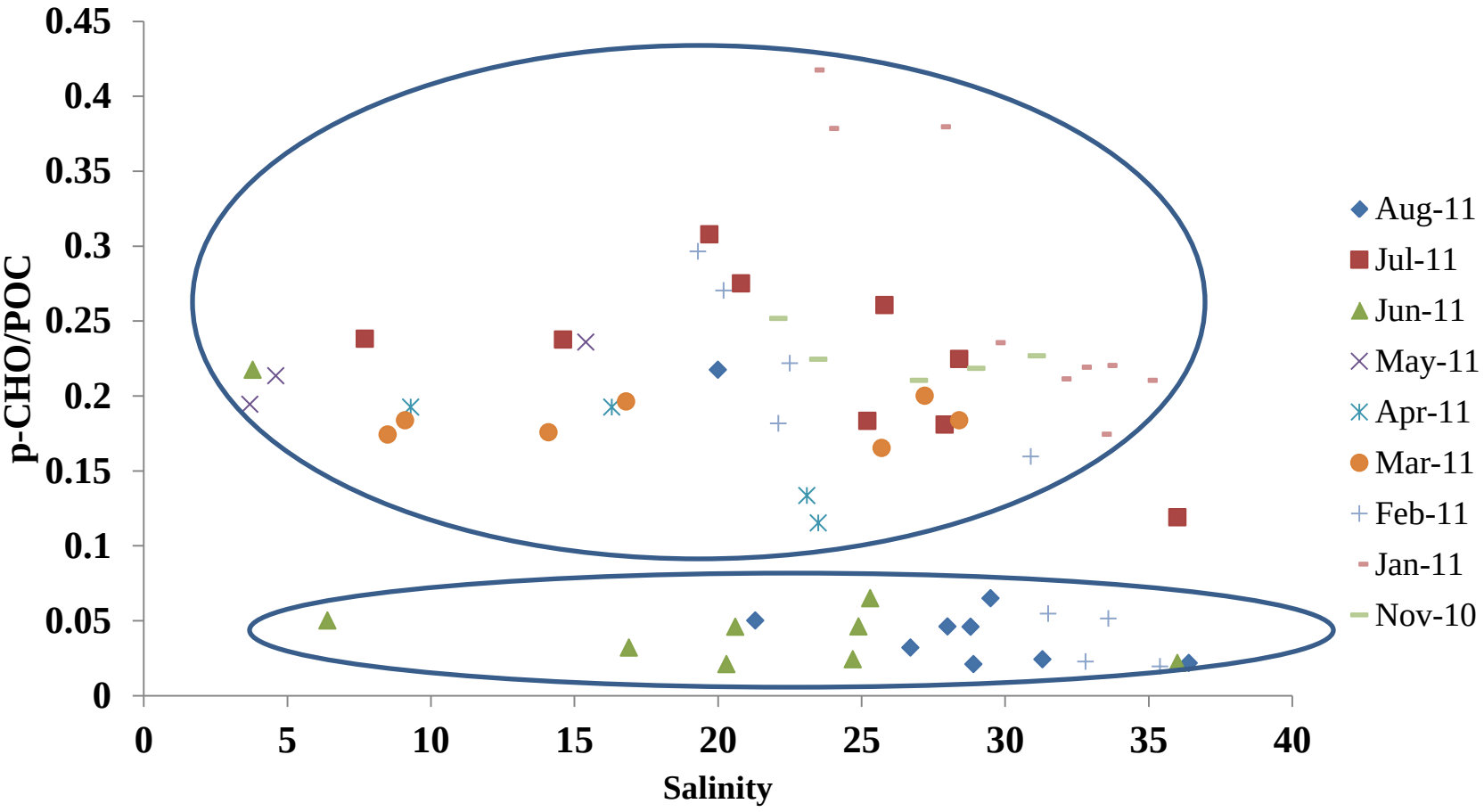
PCHO-- a more dynamic distribution and different sources

Particulate-CHO (μM-C) vs. salinity



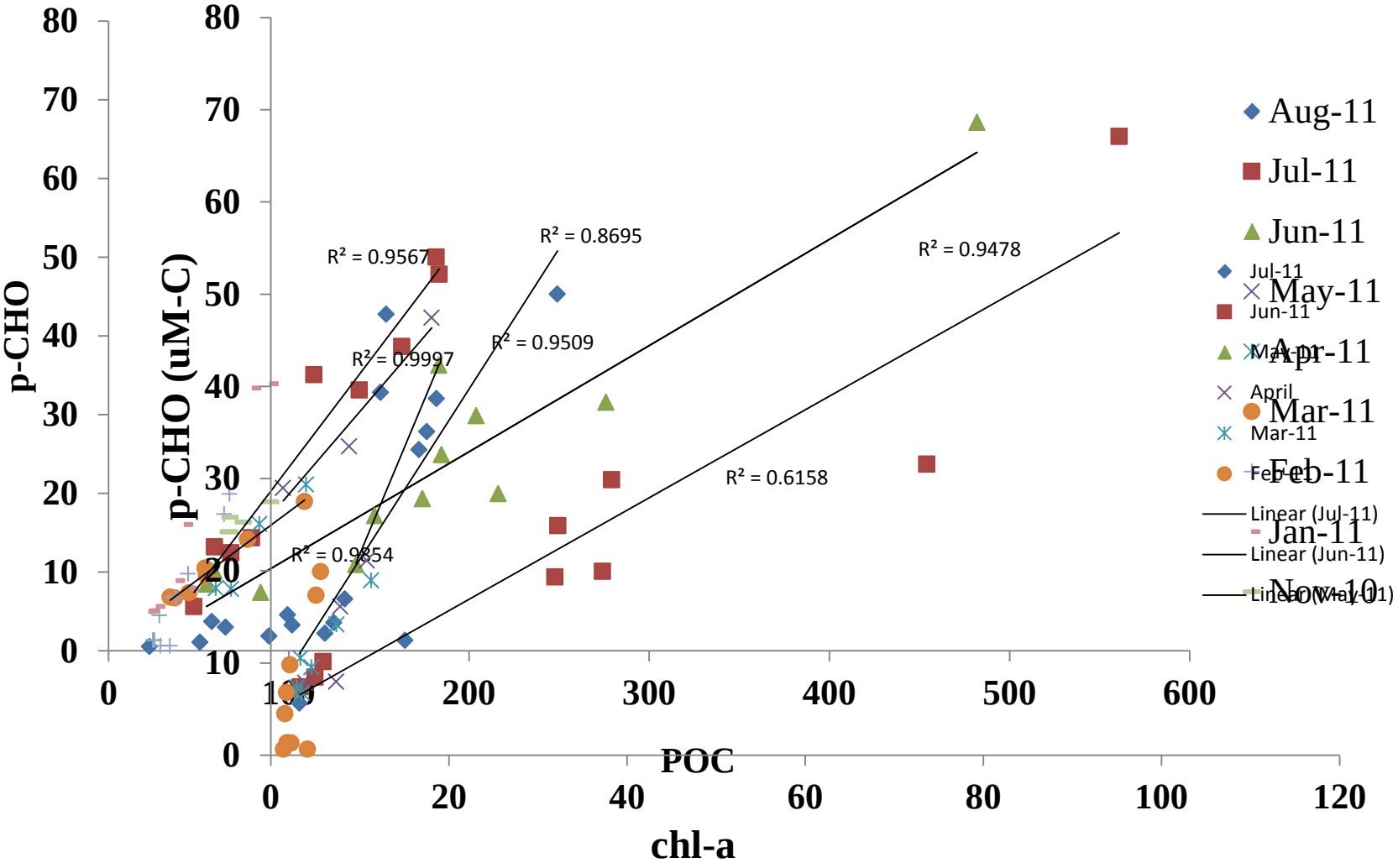
Follow the trend of suspended particulate matter concentration, POC and Chl-a

Variations in OC-normalized p-CHO



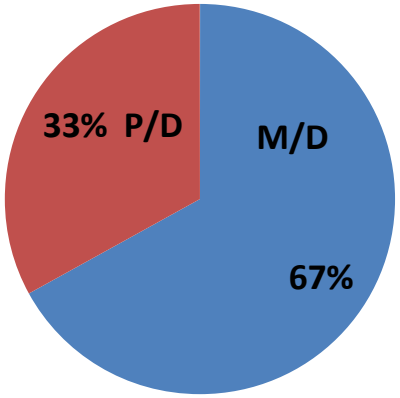
Showing less variability when p-CHO is normalized with POC

Correlation of p-CHO with POC or Chl-a

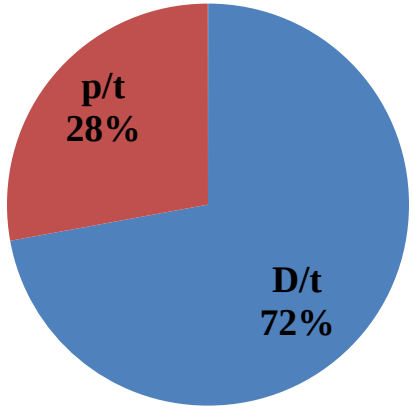


Partitioning of CHO in the Mississippi Sound/ Bight

Summer 2010



Summer 2010



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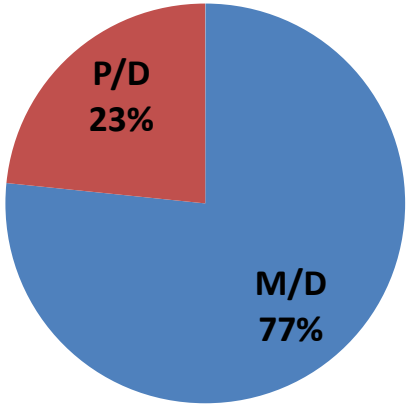
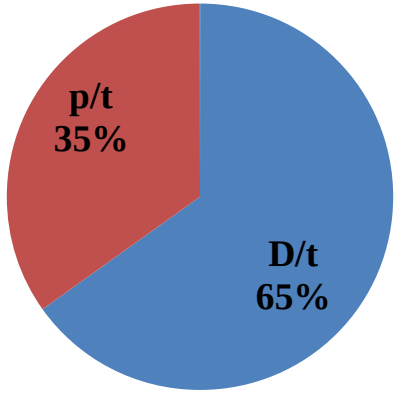
Summer 2011



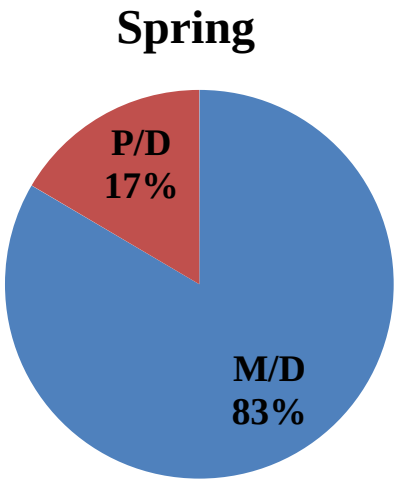
Summer 2011

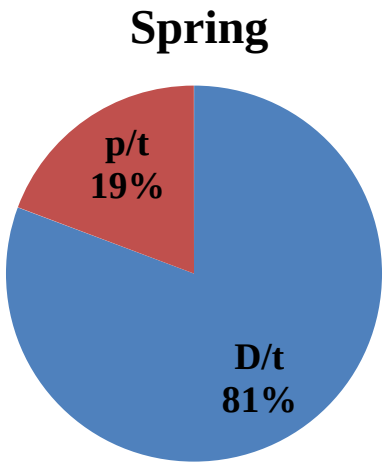


MCHO (M) vs. PCHO (P)

Dissolved (D) vs. Particulate (p)

Partitioning of CHO in the Mississippi Sound/ Bight





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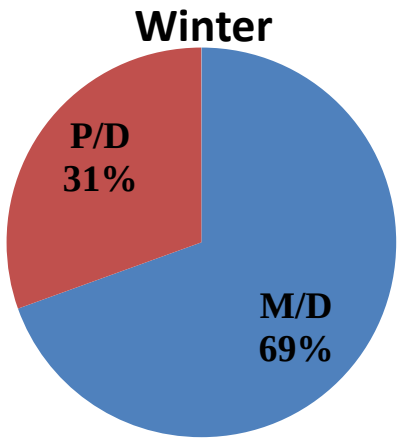
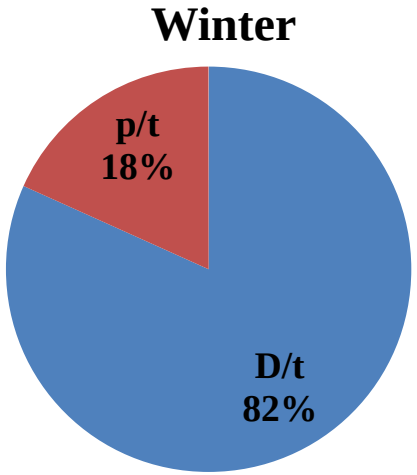
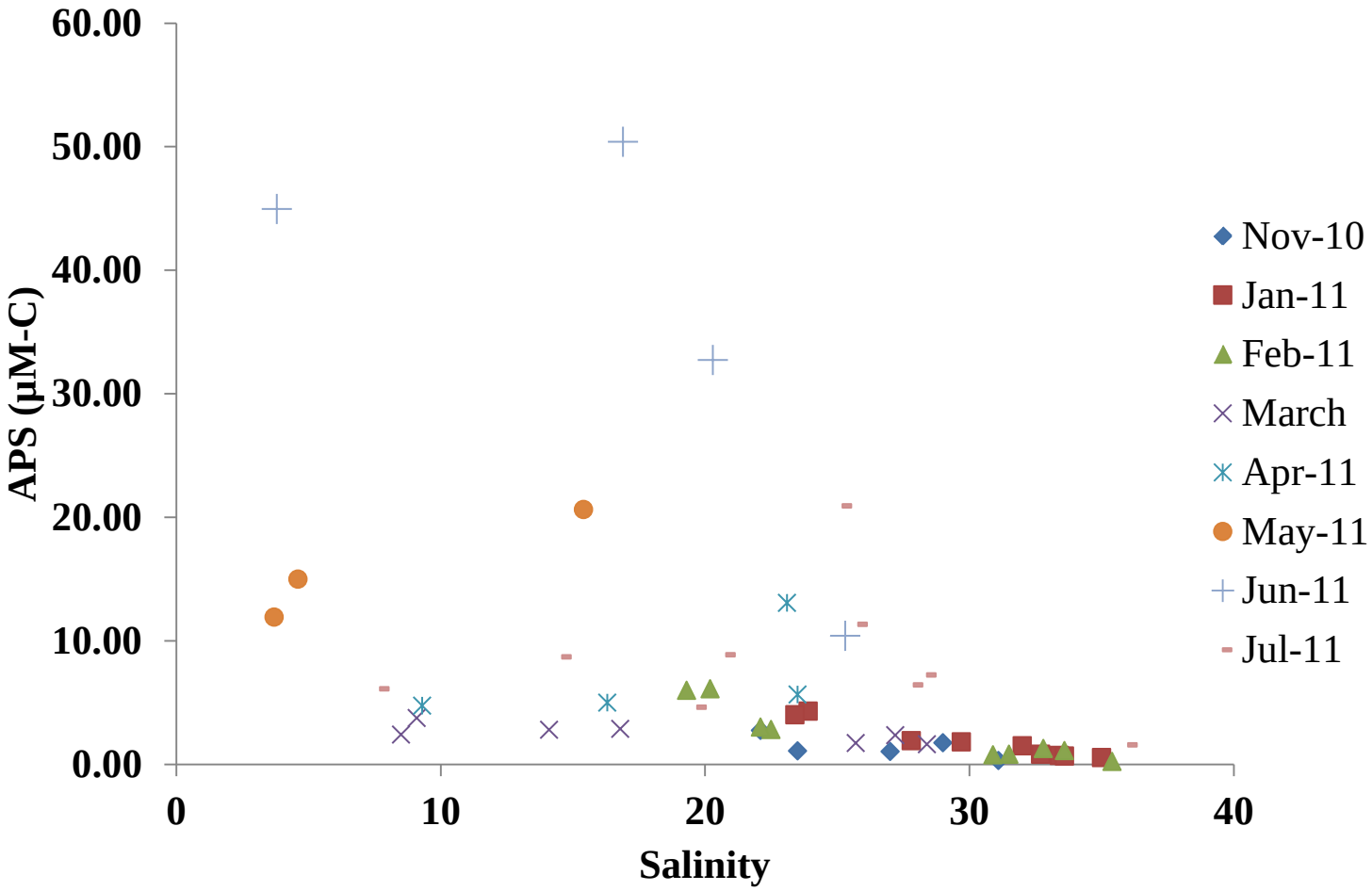




MCHO (M) vs. PCHO (P)

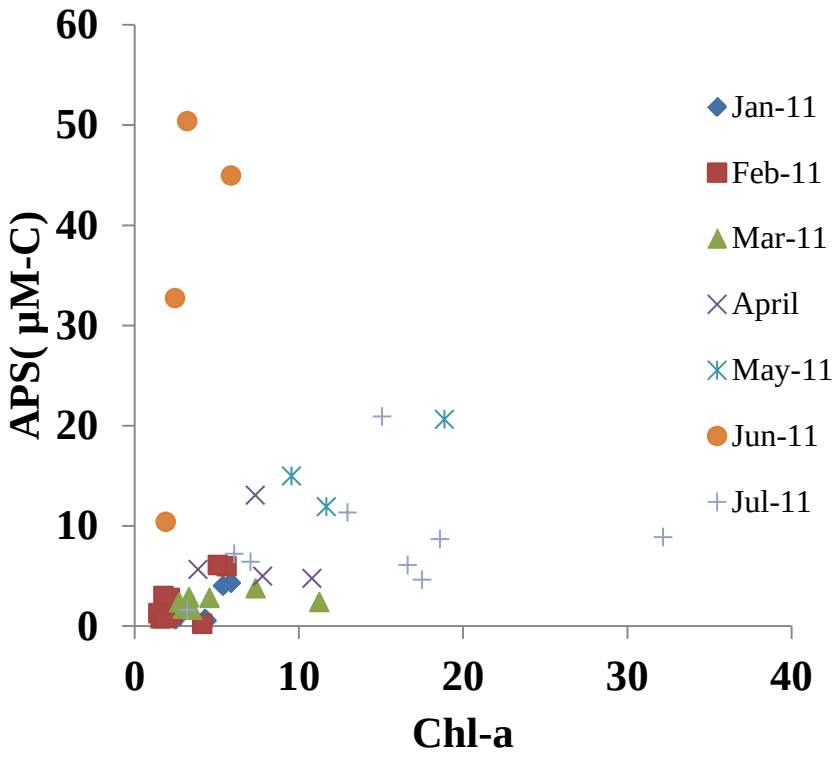
Dissolved (D) vs. particulate (p)

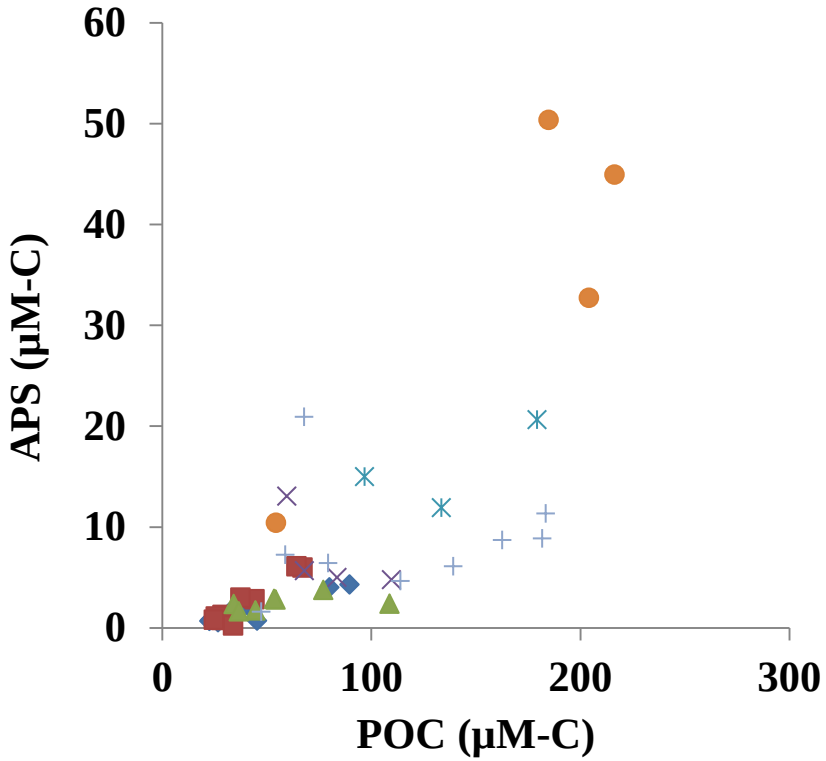
APS with salinity



Mid-salinity maximum

Correlation of APS with POC and Chl-a





Conclusions

- MCHO was the dominant CHO species.
- High MCHO abundance during March and May 2011.
- During summer 2011, p-CHO was higher than in 2010, because of the flooding/nutrient-input and higher biomass.
- Particulate-CHO increased with increasing salinity; mid salinity maximum.
- Positive correlation with POC and Chl-a
- River discharge/terrestrial inputs, nutrients, and biological processes are major factors in controlling the distribution and partitioning of CHO species in the MS/MB.

What I learned

- Better skills on graphing, interpreting the data, writing skills.

- Awareness of NOAA, their entities and their missions.

Acknowledgements

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Thank You

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