Optics and composition of particulate matter in hypoxic areas of the Texas/Louisiana shelf

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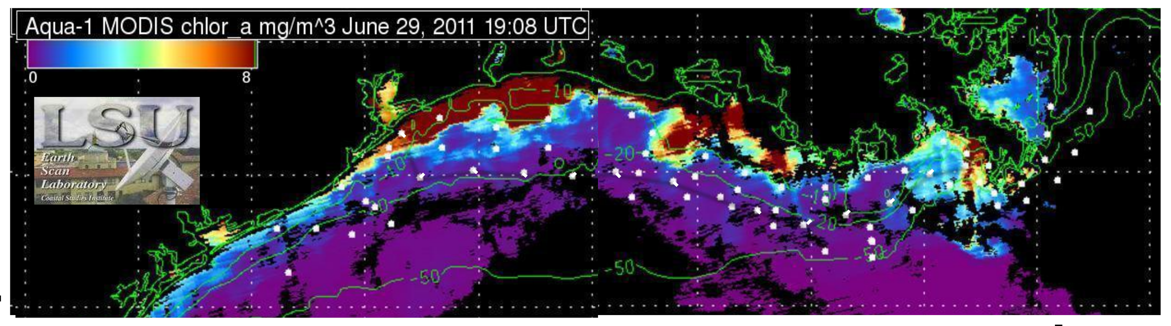
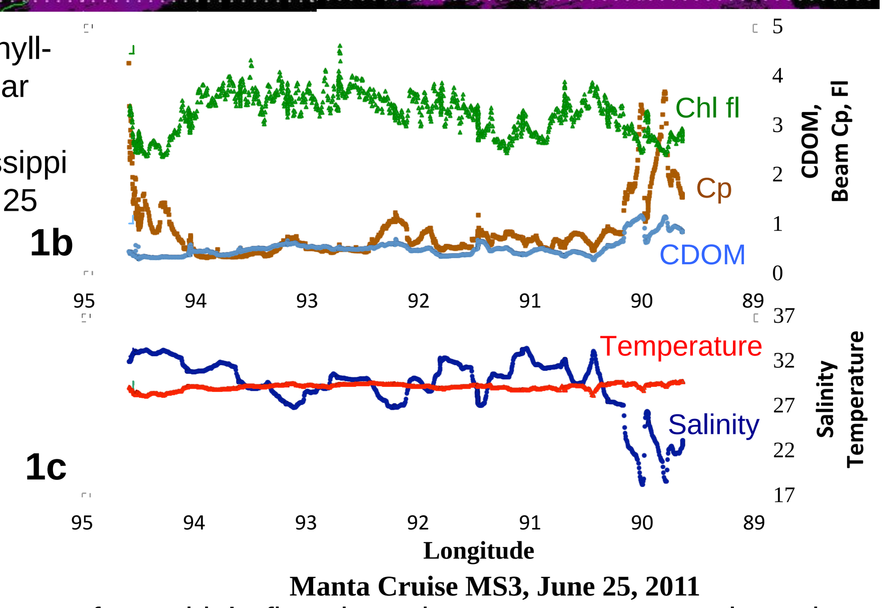
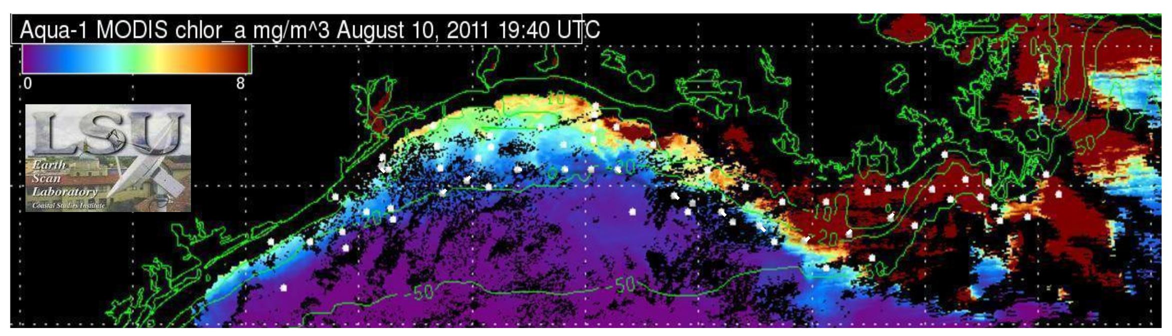


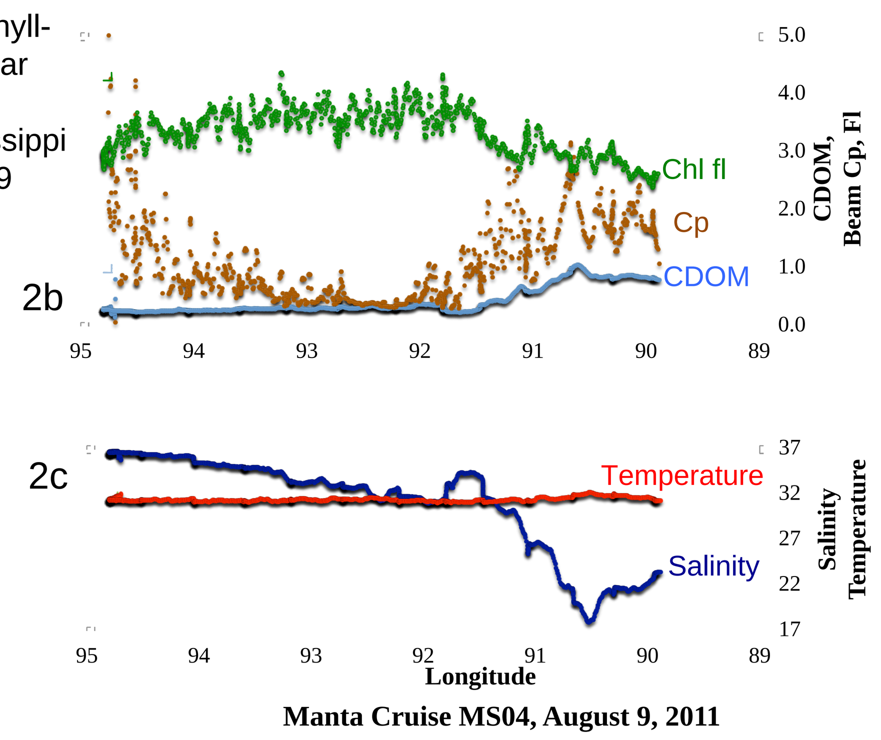
1a. **1a.** MODIS chlorophyll-a concentrations near the time of the Galveston-to-Mississippi transect on June 25 (solid line).



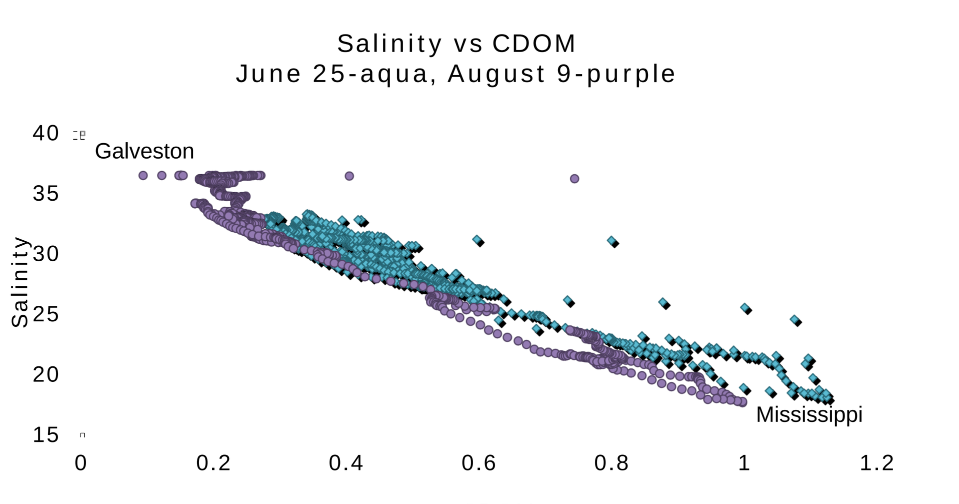
1b,c. Values of parameters from ship's flow-through seawater system along the above transect. Particle-rich (high beam c_p) water corresponds with higher CDOM, low-salinity bands of water along the transect near the Mississippi outflow.



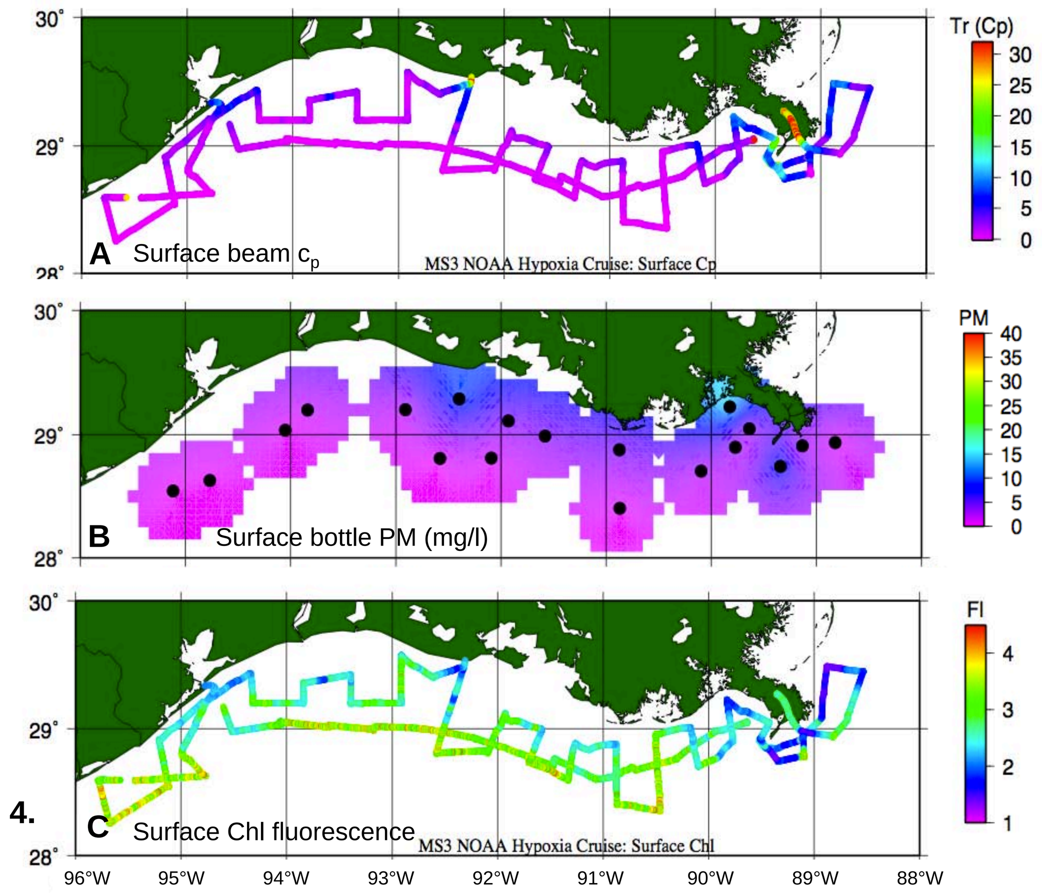
2a. **2a.** MODIS chlorophyll-a concentrations near the time of the Galveston-to-Mississippi transect on August 9 (solid line).



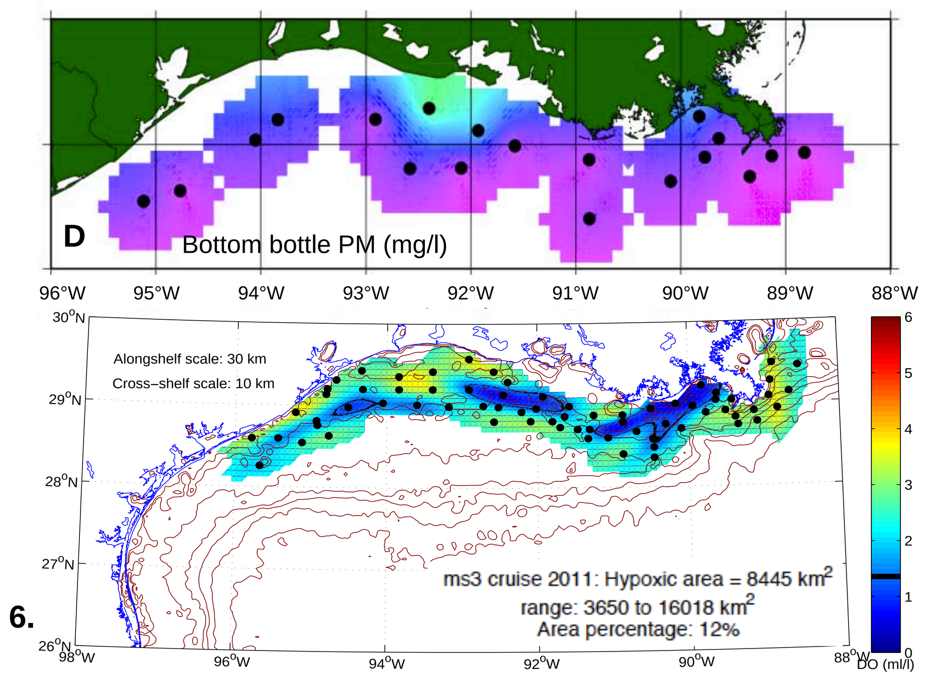
2b,c. Values of parameters from ship's flow-through seawater system along the above transect. Beam c_p and CDOM are high to the east, but CDOM remains low and salinity high near Galveston Bay.



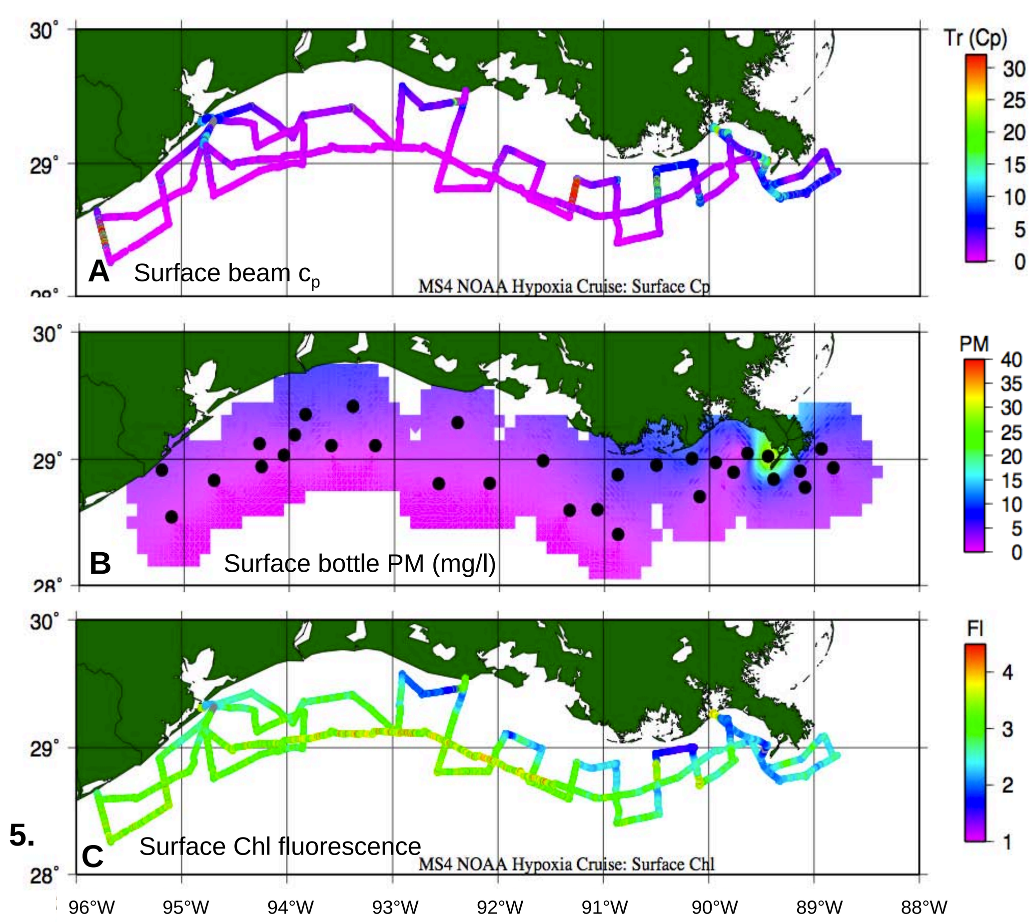
3. Salinity vs CDOM on June 25 (aqua) and August 9 (purple) shows the well-known strong inverse correlation with salinity along the entire track in Figs. 1 and 2.



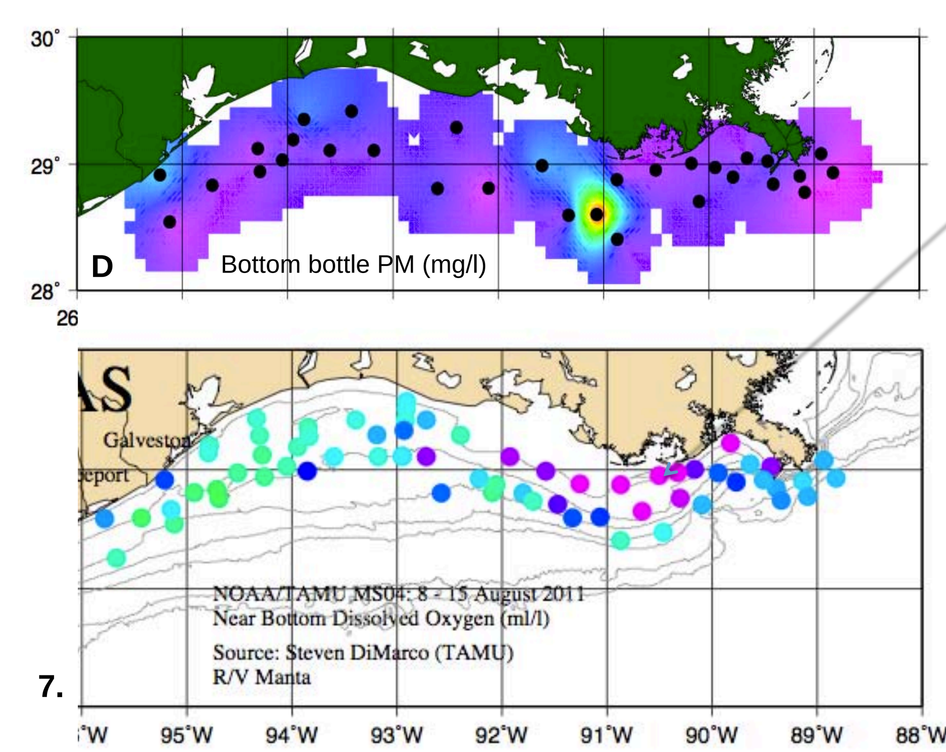
4. **4A, C.** Beam c_p and fluorescence from ship's flow-through seawater system along the transect in 2a. Surface (**B**) and bottom (**D**) bottle concentrations of particulate matter (mg/l).



6. **6.** Bottom water Dissolved Oxygen (ml/l) during June.



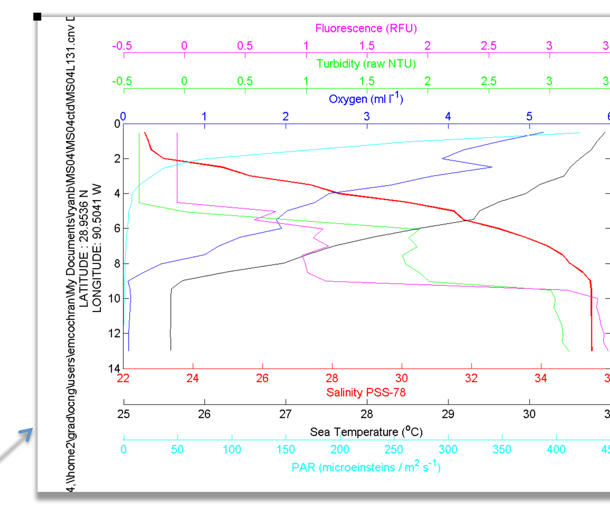
5. **5A, C.** Beam c_p and fluorescence from ship's flow-through seawater system along the transect in 2b. Surface (**B**) and bottom (**D**) bottle concentrations of particulate matter (mg/l).



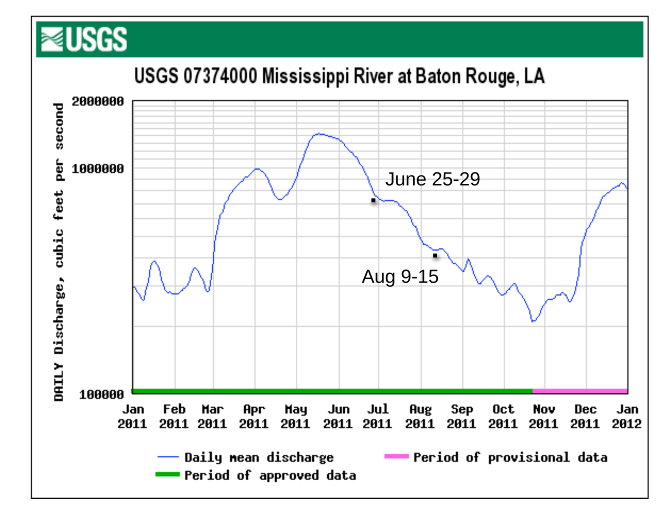
7. **7.** Bottom water Dissolved Oxygen (ml/l) during August.

Conclusions

- Particulate matter concentrations were slightly higher in June than August; river flow was ~2x greater in June than August (Fig. 9).
- The Mississippi and Atchafalaya river systems are the major sources of CDOM.
- CDOM has a strong inverse correlation with salinity.
- During June the waters across the study area contained patches of low-salinity water (<30) whereas during the lower flow August period, low-salinity water is found only east of 91.5°W.
- Some profiles show high near-bottom turbidity in low O_2 regions.

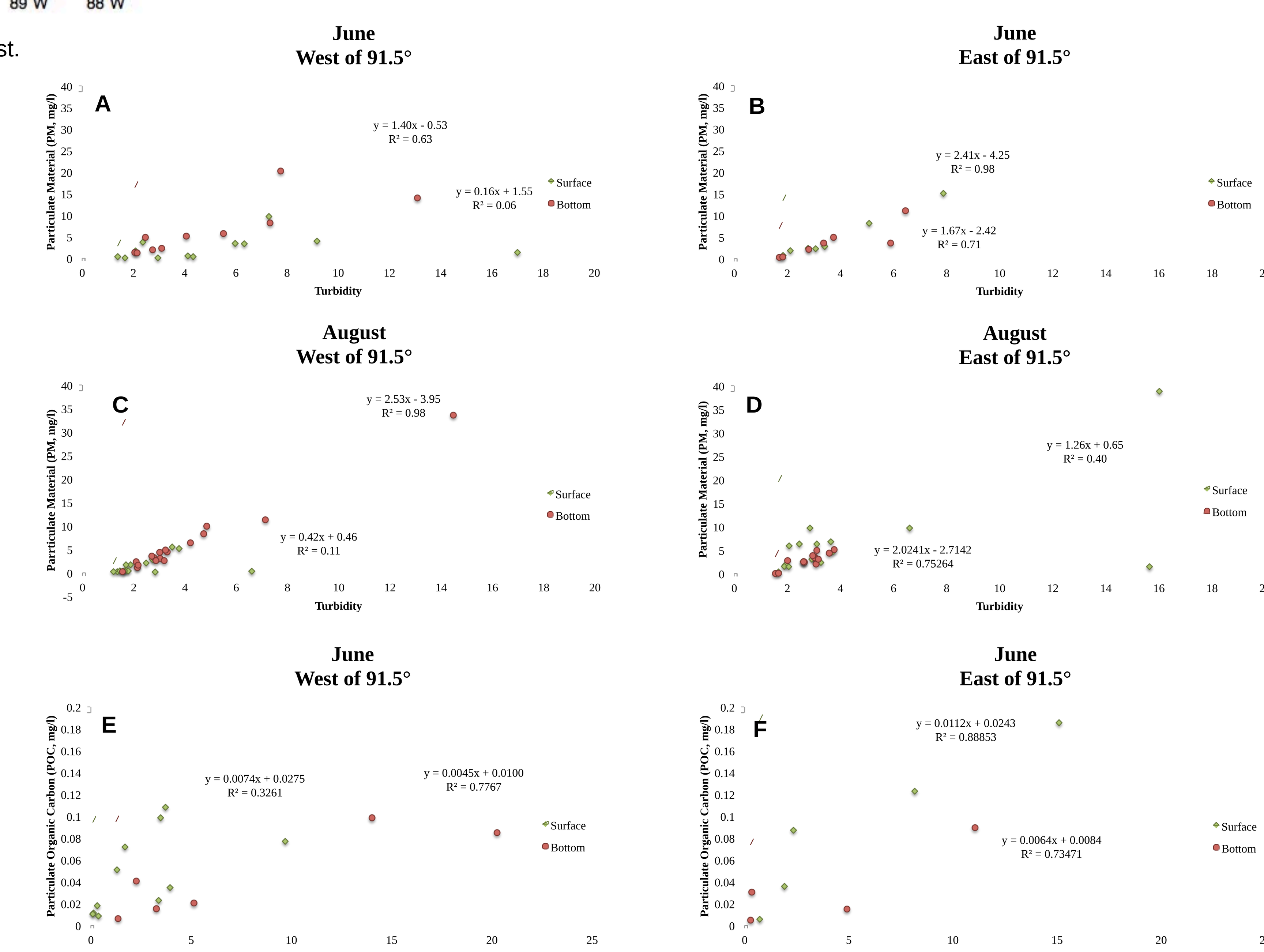


8. Well-mixed bottom layer has no oxygen and a large increase in fluorescence and turbidity.



9. Mississippi discharge 2011. June and August cruise times are noted

10. Regressions of Particulate Matter concentration (A-D) from bottle samples vs turbidity for June and August cruises. Samples were divided into regions east and west of 91.5°W on the basis of changes in Chl, c_p and CDOM distribution. The well-correlated samples indicate areas of particle uniformity vs the heterogeneity of poorly-correlated areas. Surface waters are generally less correlated than bottom waters.
Particulate Organic Carbon vs Particulate Matter concentration (E, F).



Background and Methods

Particulate matter (PM) on the Texas/Louisiana shelf has three major sources – river plumes, primary production, and resuspended sediments. The sources and processes controlling distribution and transport of these particles were investigated through optical and in-situ sampling and shipboard and shore-based analyses. During June and August 2011 cruises along the shelf, continuous measurements of surface-water particulate beam attenuation (c_p), Colored Dissolved Organic Matter (CDOM) fluorescence (WetLabs), and Chlorophyll-a Fluorescence (Chelsea) along with temperature and salinity were made using the ship's flow-through system. Discrete samples for PM and Particulate Organic Carbon (POC) concentration were collected for calibration of optics measurements from water column profiles and a surface water flow-through system during June and August 2011 cruises. Concentrations, gradients, optical and compositional values were used to infer sources of particles and their relationship to, and influence on, areas of hypoxia as part of the Mechanisms Controlling Hypoxia program.

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