Estuarine-Shelf CDOM/DOM Dynamics in Northern Gulf of Mexico from Ocean Color and Numerical Modeling

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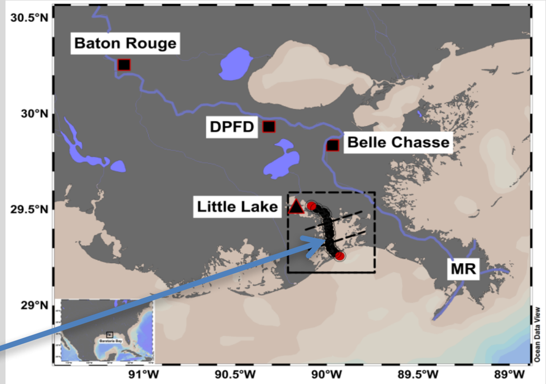
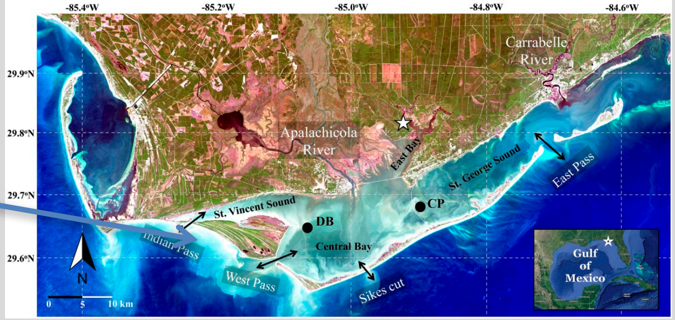
CDOM/DOM in GOM estuarine-shelf waters

•Estuarine complexes – important interface in the exchange of organic matter with coastal shelf systems

•Barataria Bay in LA is a particle-dominated estuary; river and shelf water exchange near the mouth of the bay

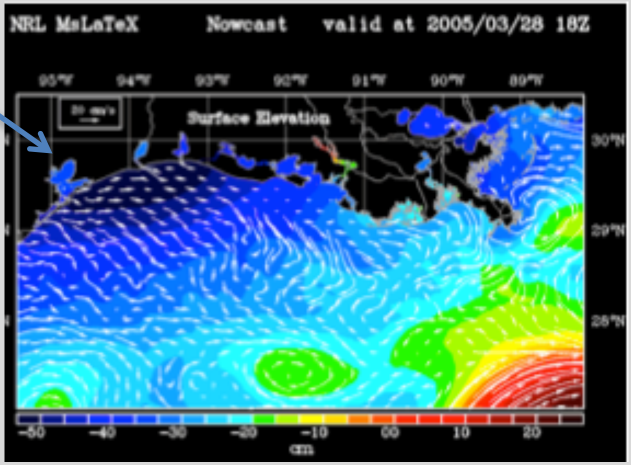


•Apalachicola Bay in FL, CDOM-dominated estuary; bar-built estuary with river a major source of freshwater



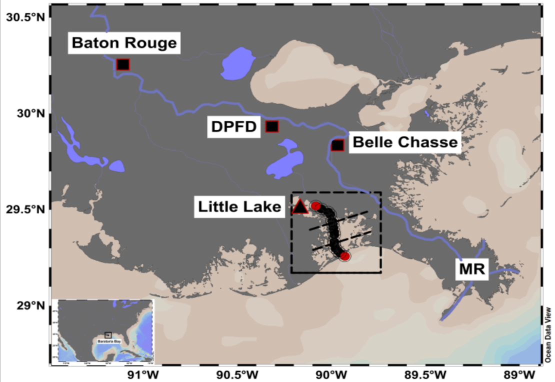
•NCOM-Navy Coastal Ocean Model, nested, 3-D; 1.9 km spatial resolution

NCOM-model simulation sea level & currents

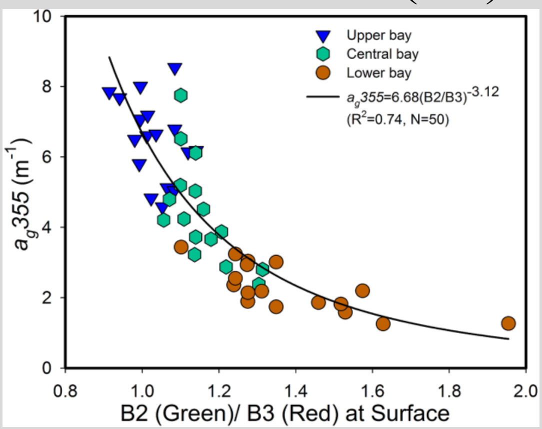


•Field obs, satellite ocean color data (Landsat, SeaWiFS, MODIS, VIIRS) and model to examine CDOM/DOM distribution, dynamics, stocks and fluxes

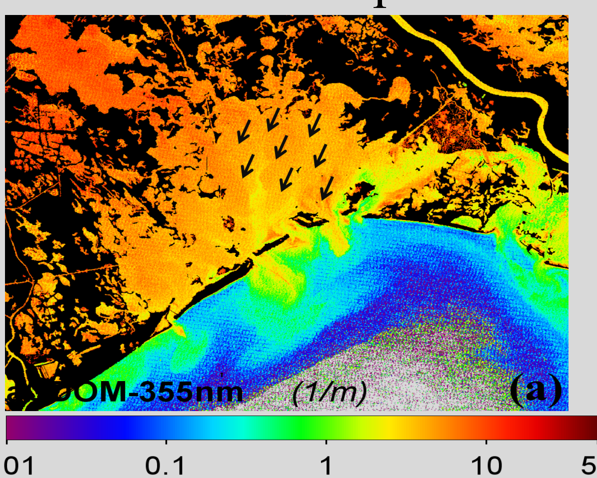
Barataria Bay-shelf CDOM/DOC distribution



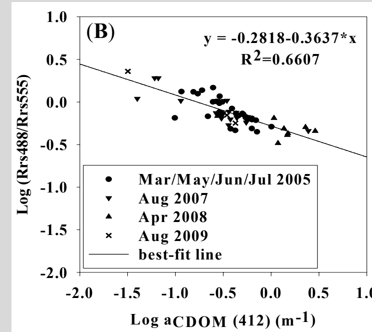
CDOM-Landsat (5/8)



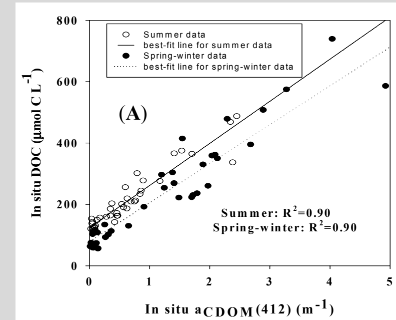
CDOM: 30 m spatial res



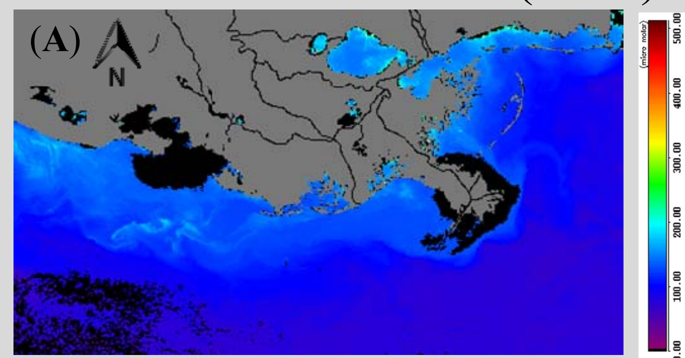
Shelf CDOM algorithm



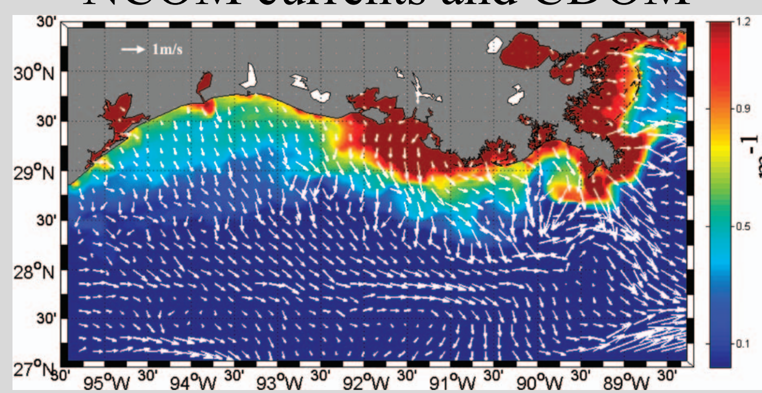
CDOM-DOC



Shelf DOC distribution (1 km)



NCOM currents and CDOM



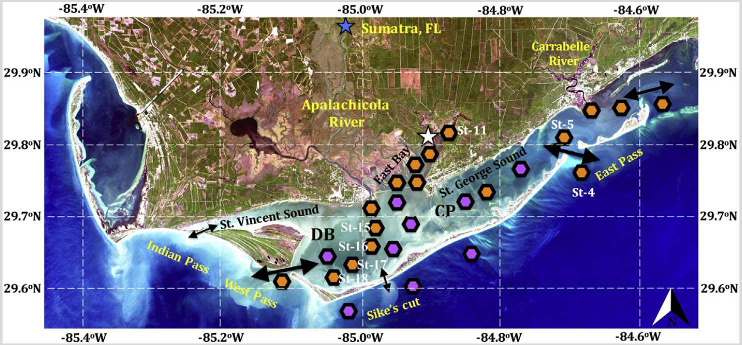
- **Goal:** estuarine-shelf DOM fluxes using satellite and nested models at different temporal/spatial scales

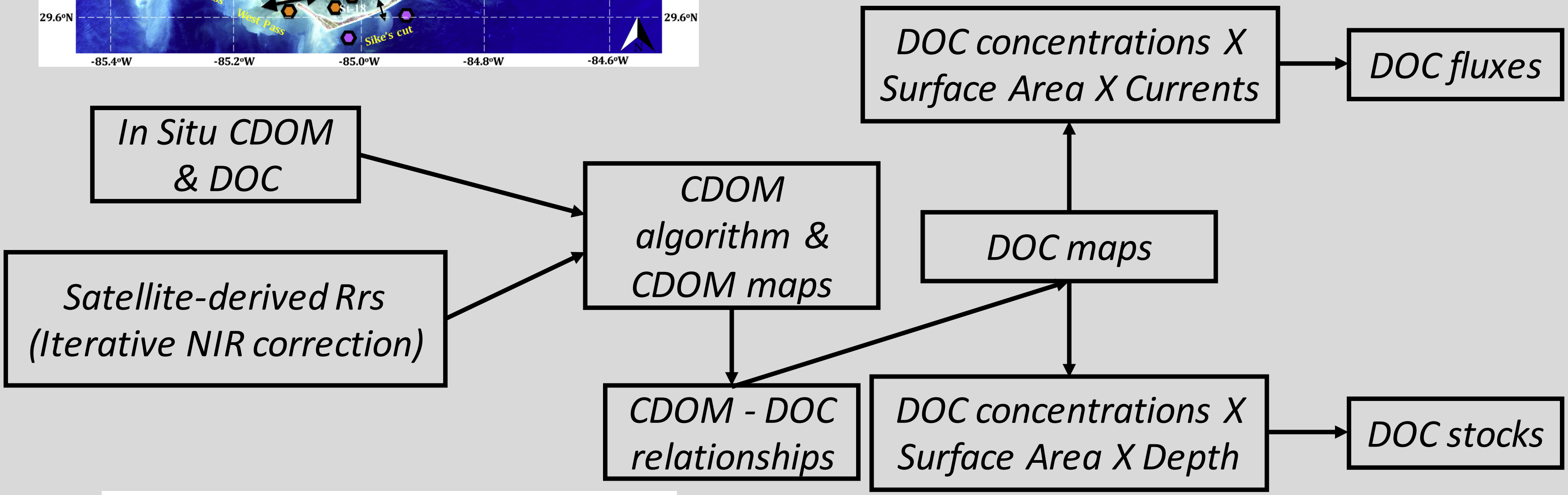
- **challenges:** seasonally varying plume and river water inflow into the bay through the passes; cold fronts, storms

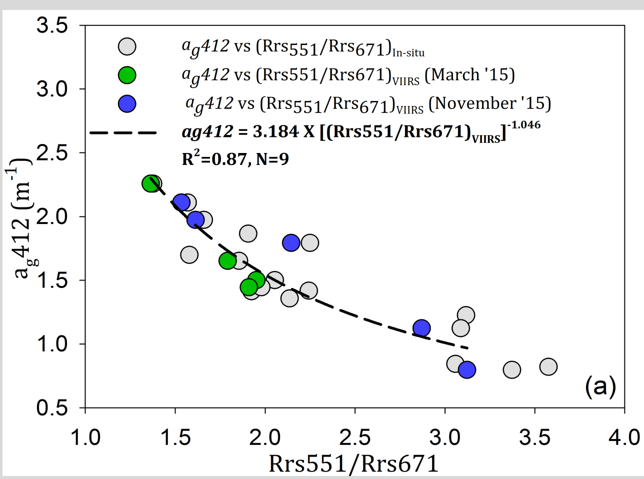
Tehrani et al. 2014, J Coast. Res; Joshi & D'Sa, 2015, Remote Sens.

Apalachicola Bay
CDOM/DOC Stocks and fluxes
VIIRS/NPP & NCOM

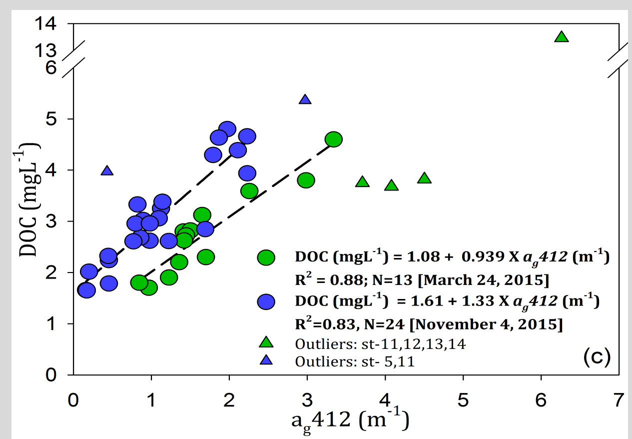
Joshi et al. 2017, Remote Sens. Environ.





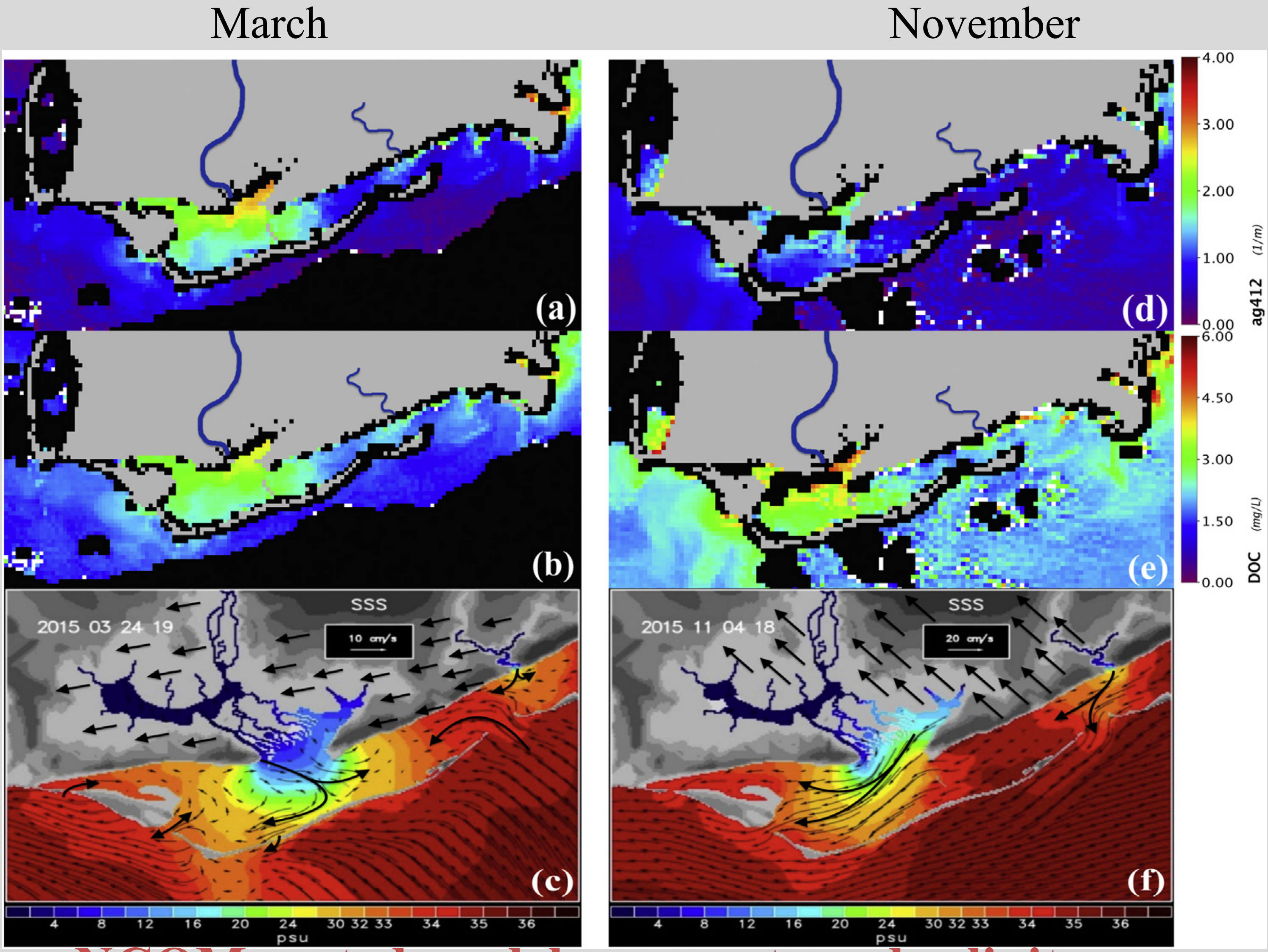


A VIIRS-based CDOM algorithm



Seasonal CDOM – DOC relationship

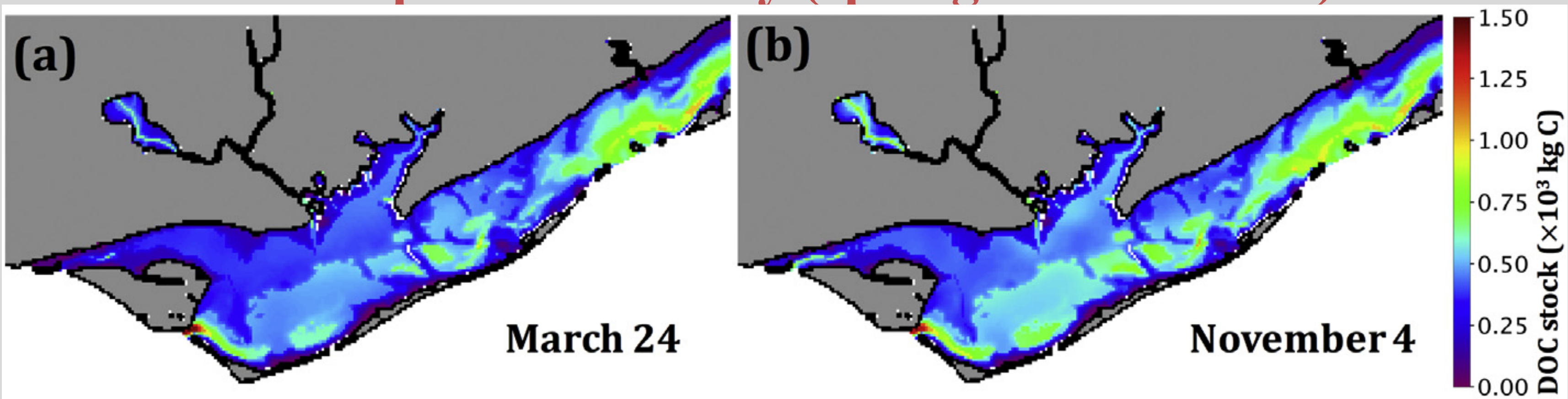
VIIRS/NPP: CDOM and DOC maps



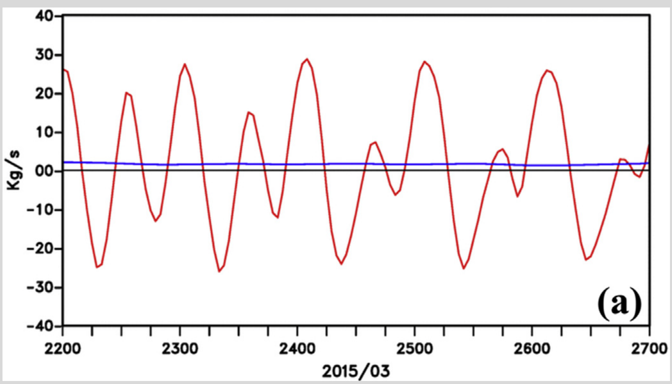
NCOM nested model - currents and salinity

- Strong linkage between river plume and overall hydrodynamic forcing controlling the distribution of DOC

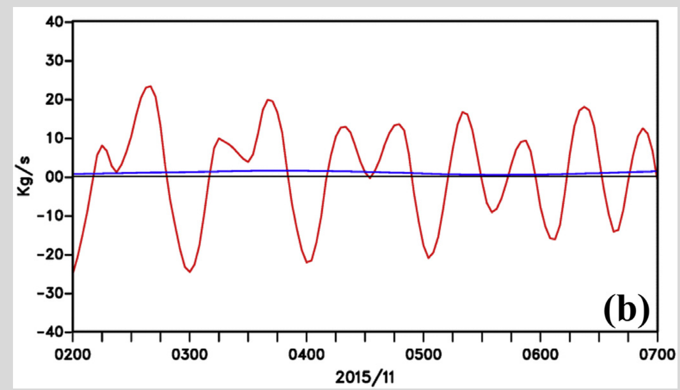
DOC Stocks in Apalachicola Bay (spring and fall 2015)



Estimated DOC stocks: ~3.71 x 10^6 (Mar) ~4.01 x 10^6 kg C (Nov)



DOC Fluxes



Volume flux (out of the bay) almost doubled for Mar 24 (735 m^3s^{-1}) relative to Nov 04 (378 m^3s^{-1}). However, estimates of DOC fluxes exported out of the bay were only marginally greater in March (0.163 x 10^6 kg C d^{-1}) than in Nov (0.124 x 10^6 kg d^{-1}) and reflected greater DOC stocks in the fall

Challenge: assumption of well-mixed water column – DOC overestimates