Investigating vertical and horizontal trends in the Cape Fear River Plume water column: Evidence of buoyancy- driven transport

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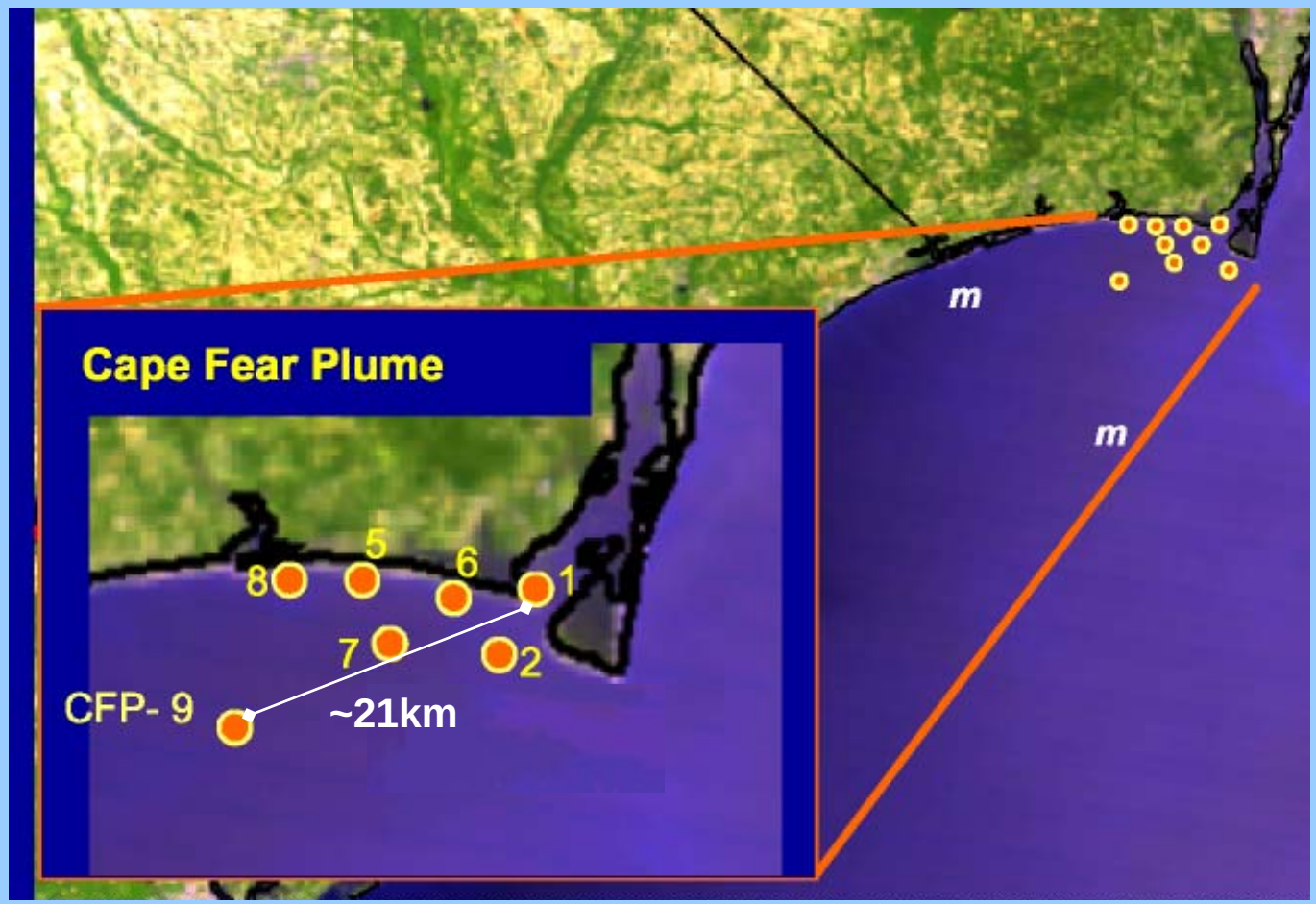
Purpose

- Investigate buoyancy- driven cross- shelf transport of terrestrial organic matter

Why?

- Previous studies paint picture of transport of surface water
  - Horizontal trends
- What is going on below the surface?
  - Vertical Trends
- 3-D Dynamic system!!!

Study Site:
Cape Fear River Plume- Long Bay North Carolina



Sampling regime

- Bi- monthly cruises in conjunction with CORMP (Coastal Ocean Research and Monitoring Program) on RV Cape Fear

Water collection

- CTD with rosette deployed and based on CTD profile, water samples taken at bottom, mid and surface of the water column

Filtration

- Filtrate collected after GF/F and 0.2μm millipore filtration

Now for the fun gadgets...

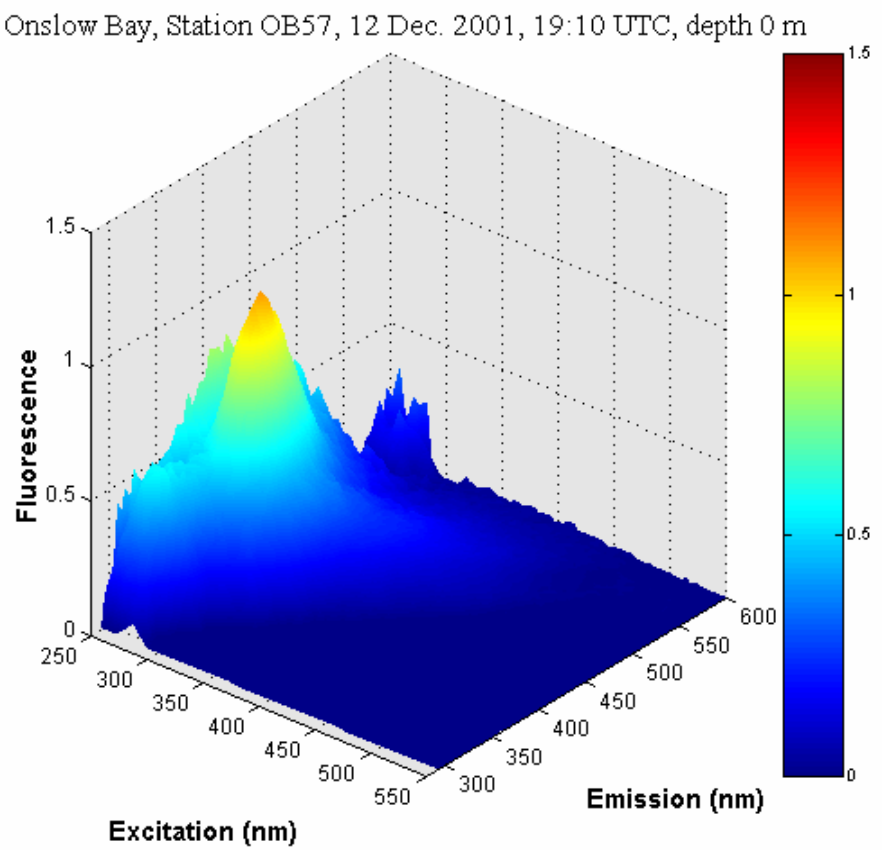
- **UV- vis spectroscopy**
  - to determine general character of DOC and whether dilution is necessary for fluorescence spectroscopy
- Total **Dissolved Organic Carbon** Analysis
  - Schimadzu 5000a
- Excitation-Emission Matrix Fluorescence Spectroscopy (EEM)
  - 3-D Fluorescence

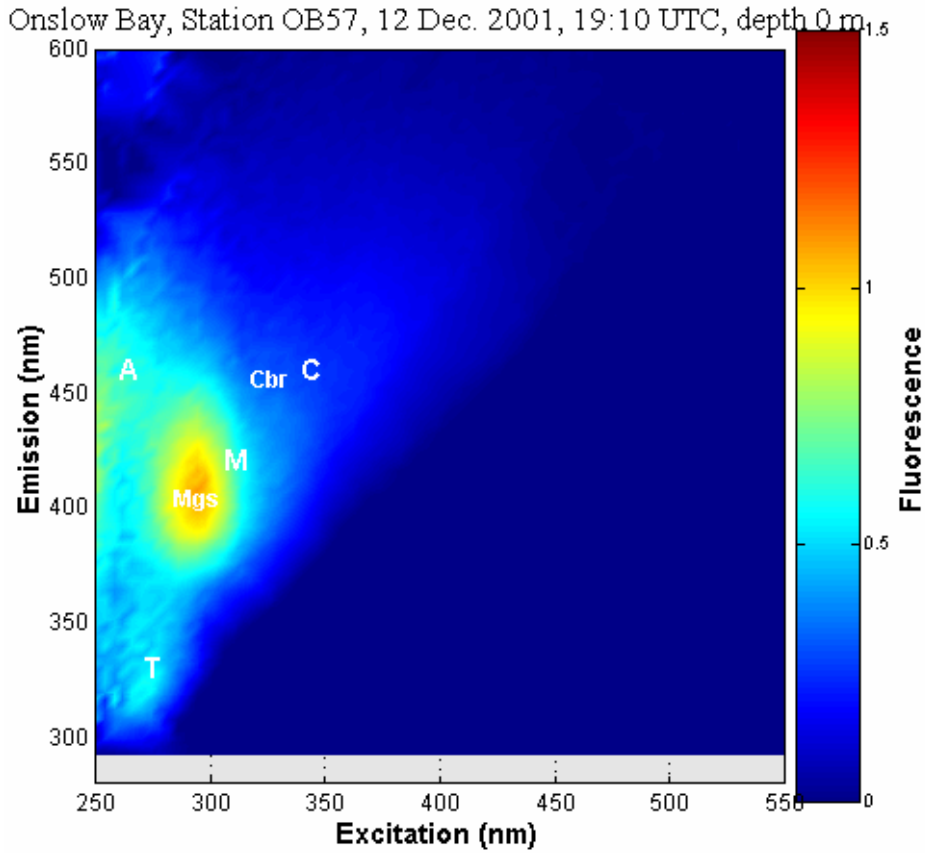
What is EEM?

- SPEX spectrofluorometer
  - excitation range 250-500 nm
    - increments of 5 nm
  - emission range scanned 280-600 nm
  - 30 nm offset between excitation and emission
  - results scaled in QSE units
    - quinine sulfate equivalent

What does it look like?

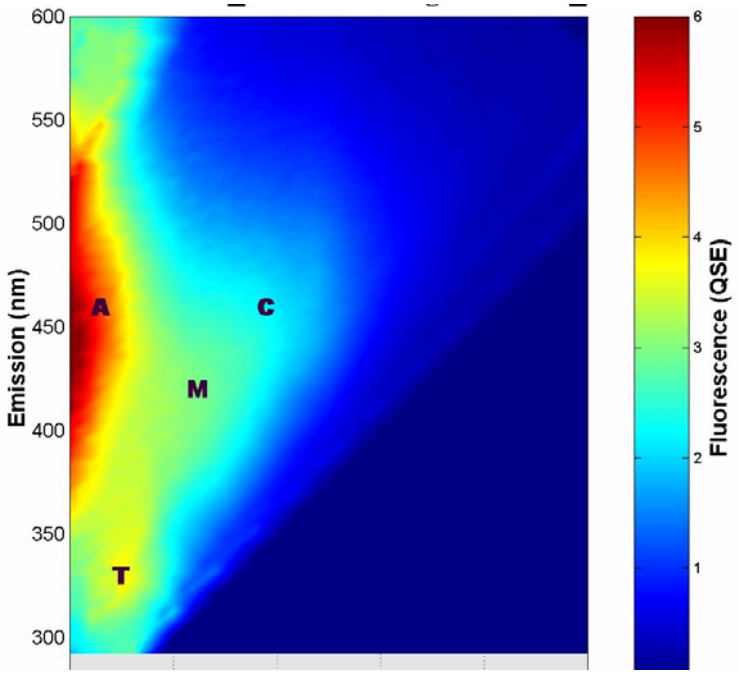
- "Mountain view"
- Em/Ex view





What do EEM spectra tell us?

- Signature peaks



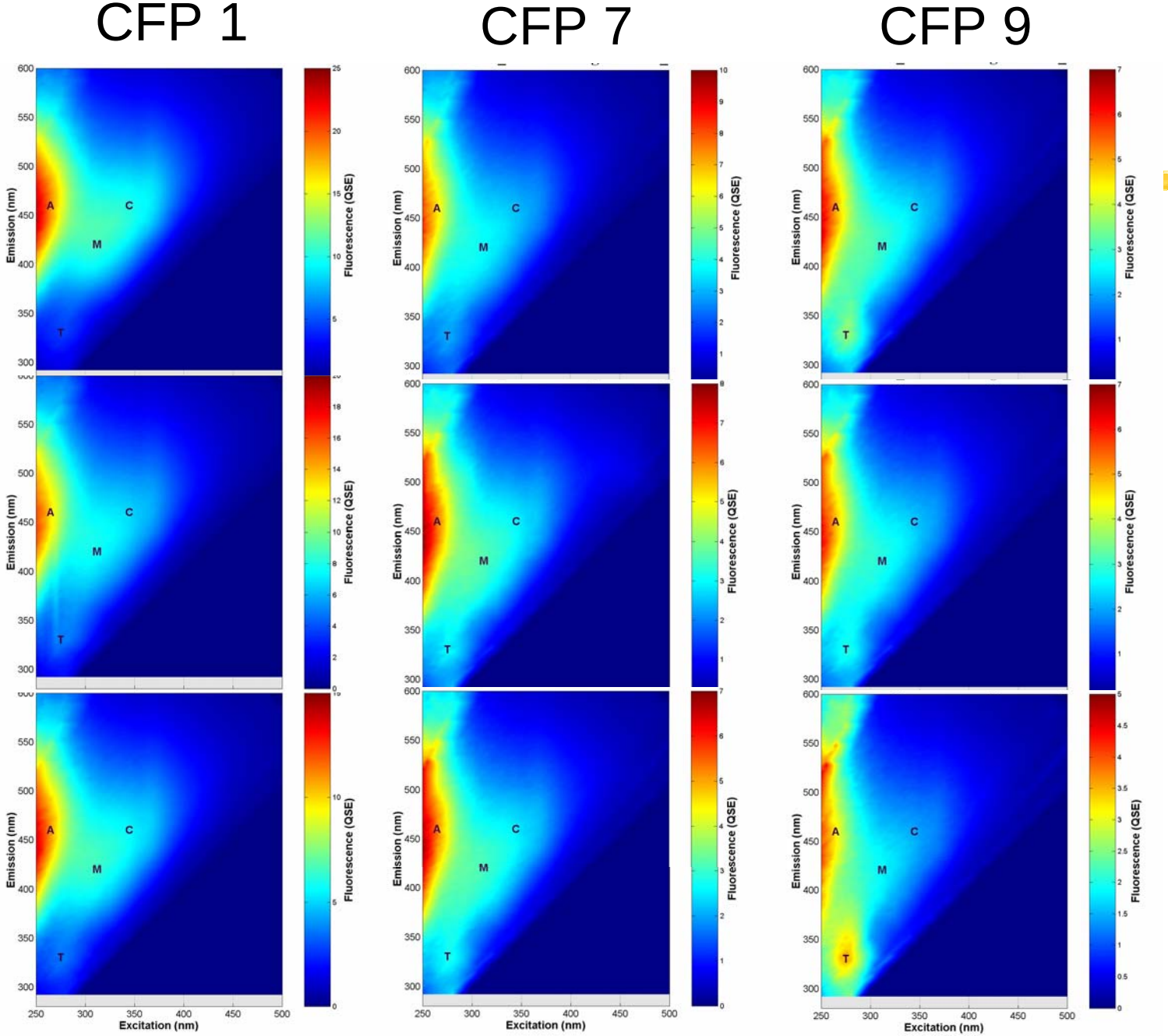
- **A** peak – terrestrial humic acids, Ex./Em. 265/460
- **C** peak – terrestrial fulvic acids, Ex./Em. 345/460
- **M** peak – marine fulvic acids Ex./Em. 312/420
- **T** peak–protein: tryptophan and tyrosine Ex./Em. 275/330

- For quantitative analyses: peak integration

Jan 6th 2004

Discharge rate: 6,731 ft^3/s

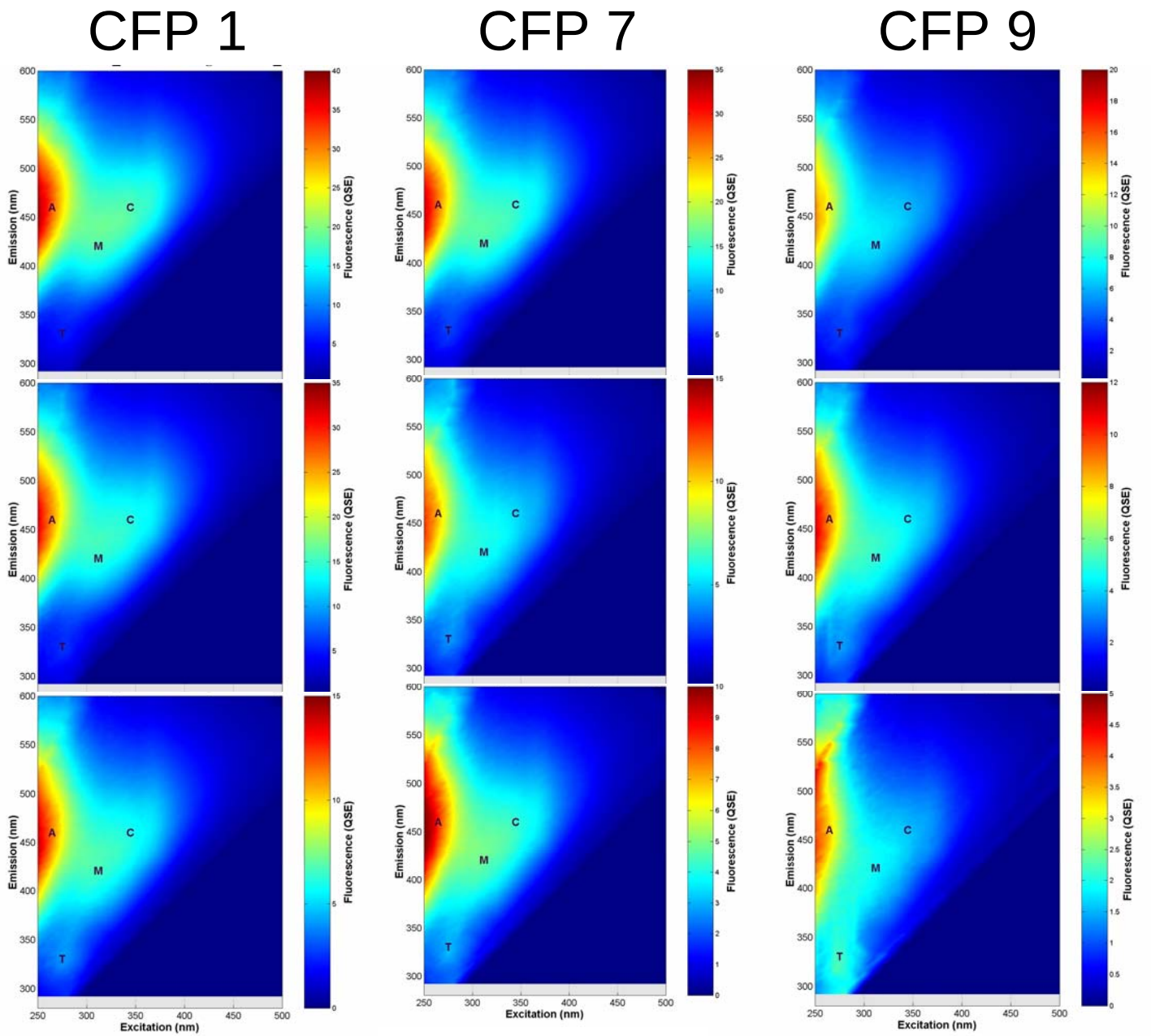
Avg. from 1969-2004: 11,940 ft^3/s



March 4th 2004

Discharge rate: 19,981 ft^3/s

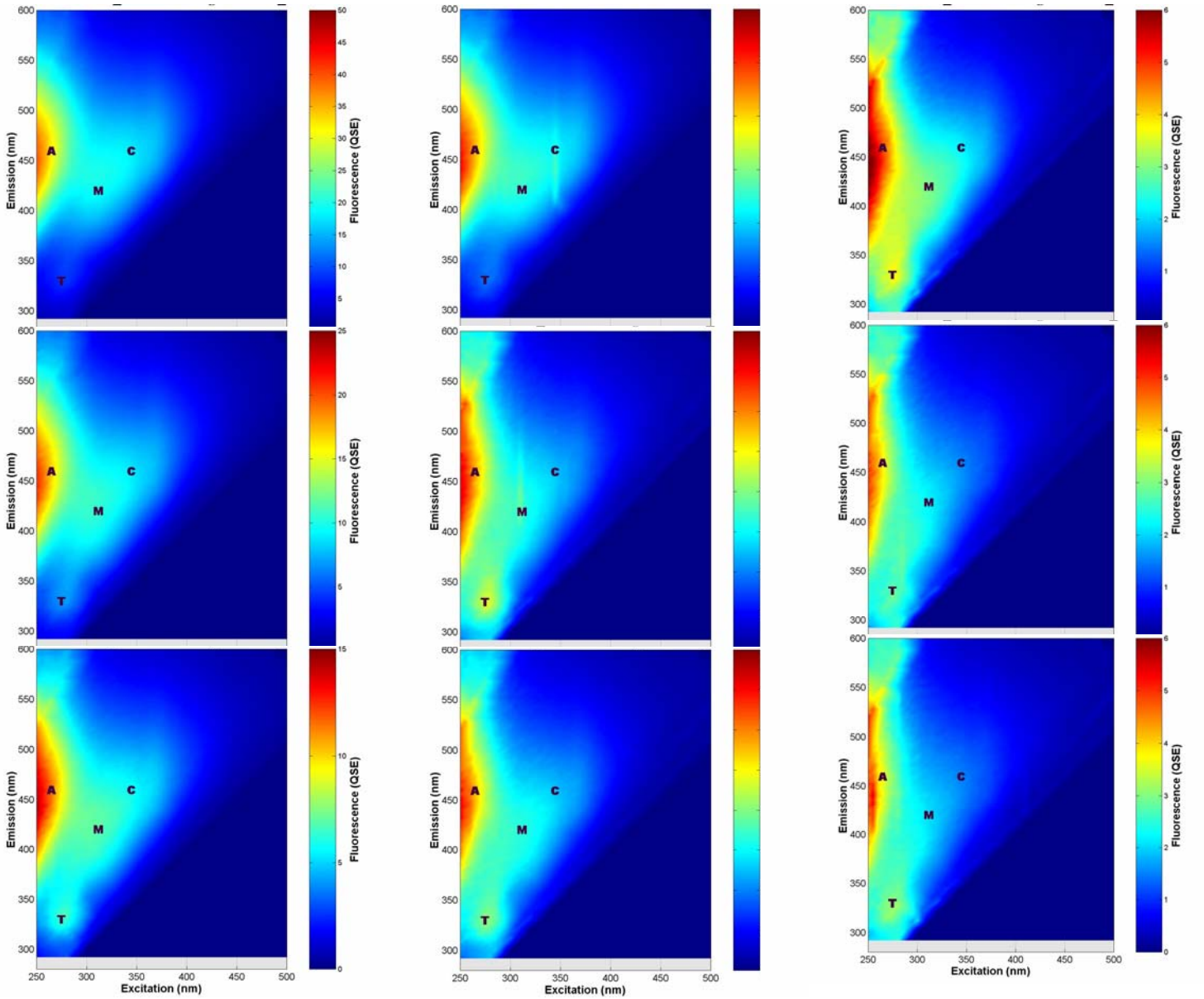
Avg. from 1969-2004: 19,554 ft^3/s



May 17th 2004

Discharge rate: 4,711 ft^3/s

Avg. from 1969-2004: 6,846 ft^3/s

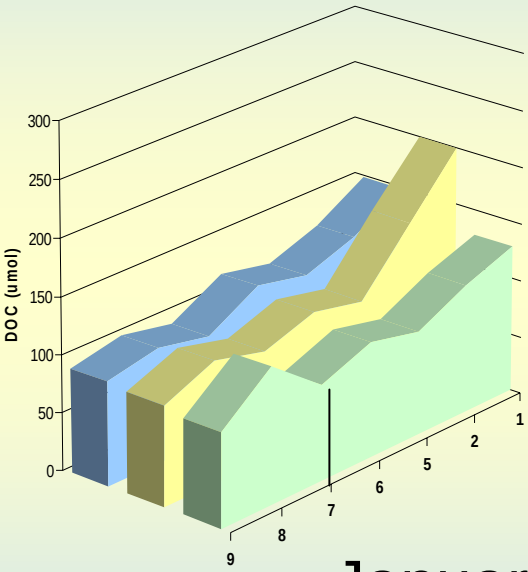


Summary: CDOM

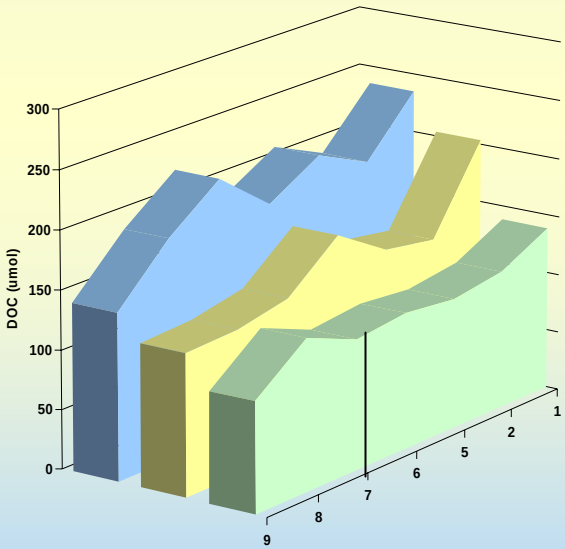
- CDOM signature varied significantly with depth
- CDOM signatures were much more intense at site CFP9 in January than March or May
- There was little variation in CDOM concentration at CFP1 between the three months.

Results: DOC

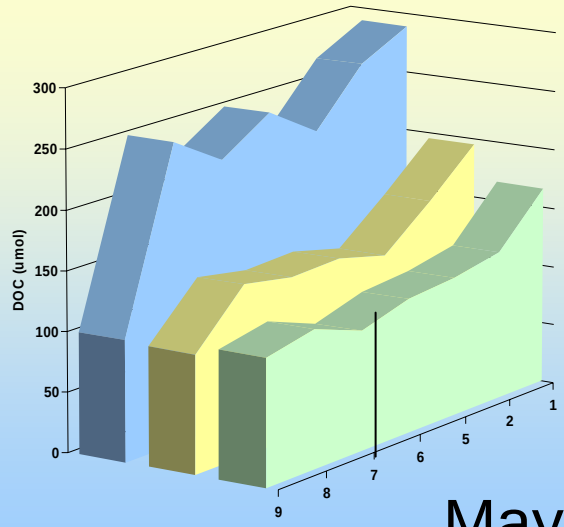
Surface
Mid
Bottom



January



March



May

Summary: DOC

- Bottom water [DOC] was fairly constant among stations and increased from January to May.
- Average January [DOC] did not vary significantly in the water column
- May showed significant increase in surface [DOC] at the sites closer to the mouth, but a decrease at CFP9 where CDOM analyses also supported the presence of a thoroughly mixed water column.

So what does it all mean?

- Results show distinct vertical changes in carbon signatures from surface to bottom as well as transitions from site CFP1 at the mouth and site CFP9
  - Need to look at whole 3-D picture
- CDOM analyses (EEM) is a useful tool for determining the origin and fate of water transport

Special Thanks to:

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