Carbon in the Gulf of Mexico: MMS Perspective

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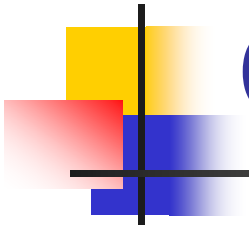


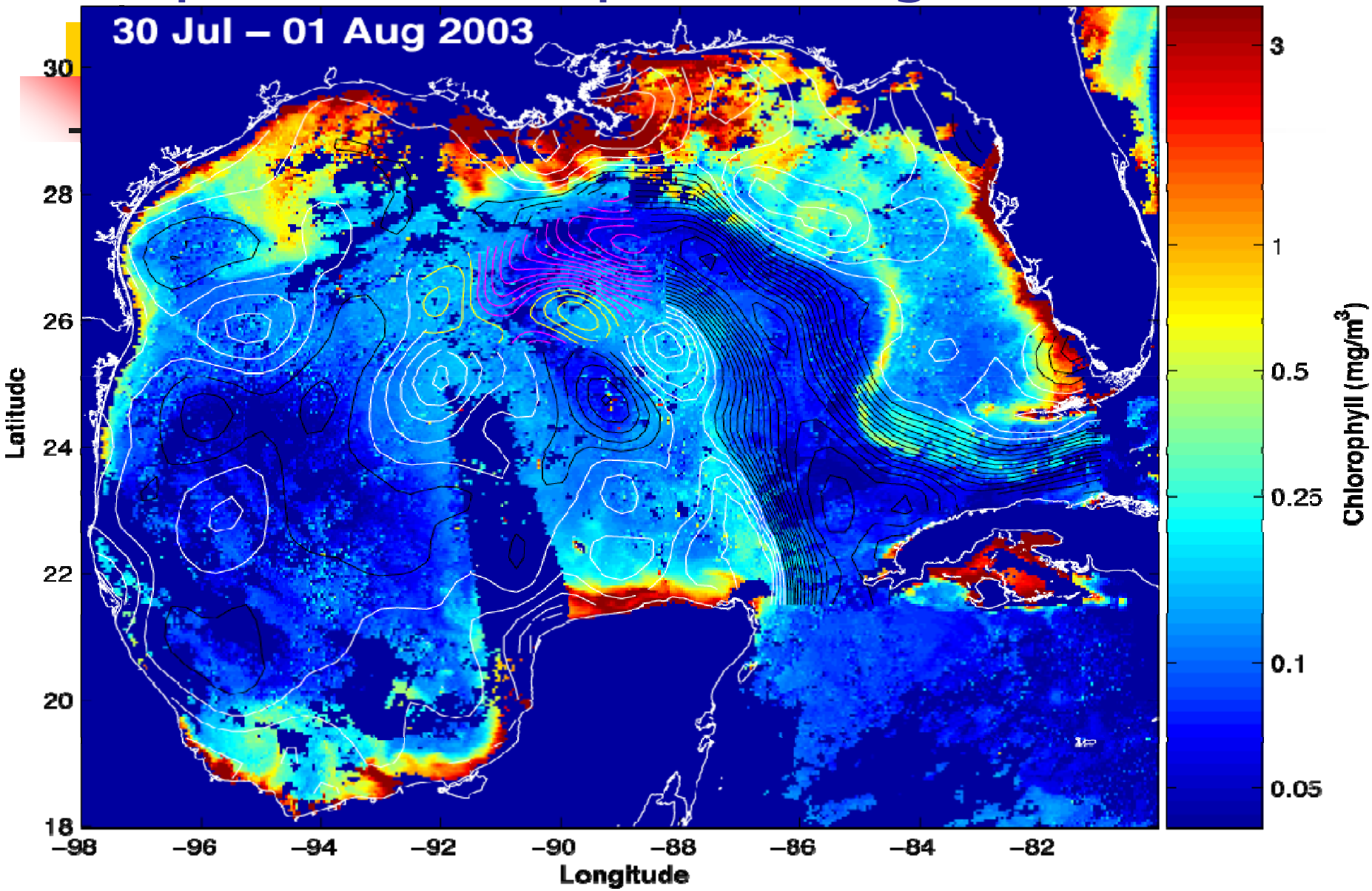
Outline

- Example of shelf-deepwater interaction
- Vertical fluxes-are these forgotten?
- Some climate concerns
- A research suggestion

MMS Perspective on Carbon

- Shelf is main site of carbon generation (photosynthesis-driven).
- Shelf-deepwater exchange in the Gulf driven mainly by mesoscale features and winds
- Large Vertical fluxes over the Continental Slope
  - Hydrocarbon seeps
  - Deep Coral reefs
  - Chemosynthetic Communities
- T&S Climate Changes in the Gulf
  - Can affect hydrates, pH, O_2, and carbon flux

Frequent shelf export of organic matter

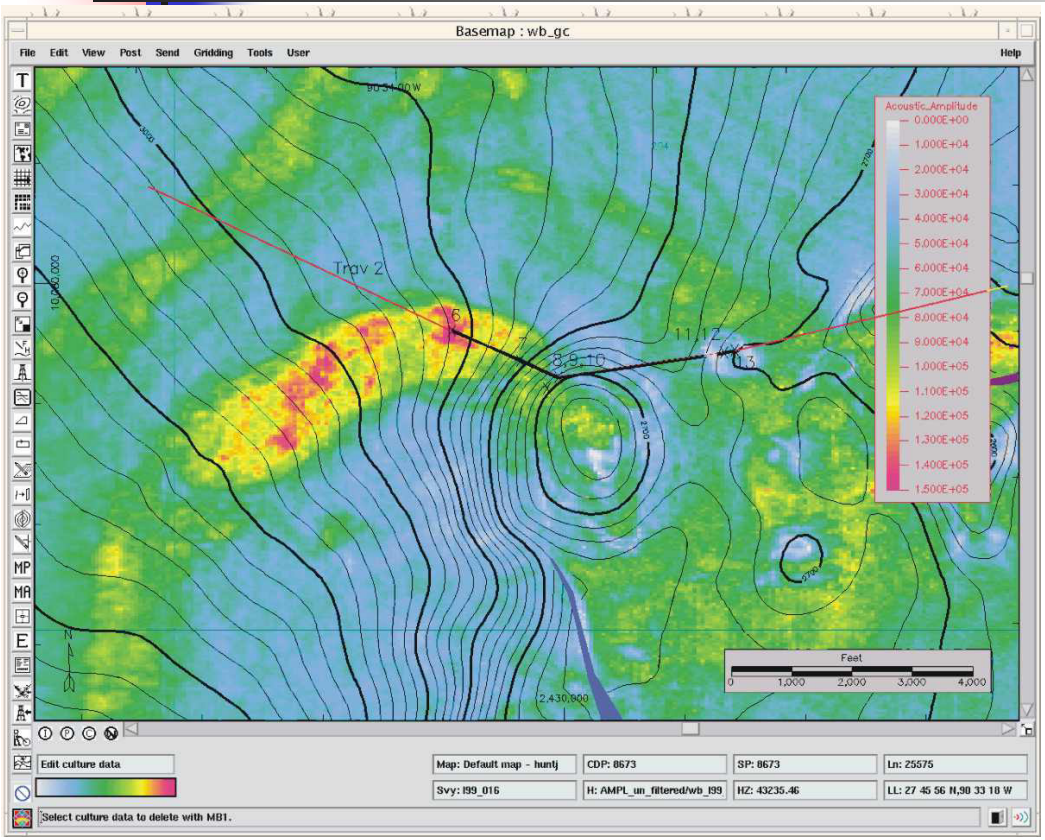


Relevant Vertical Fluxes

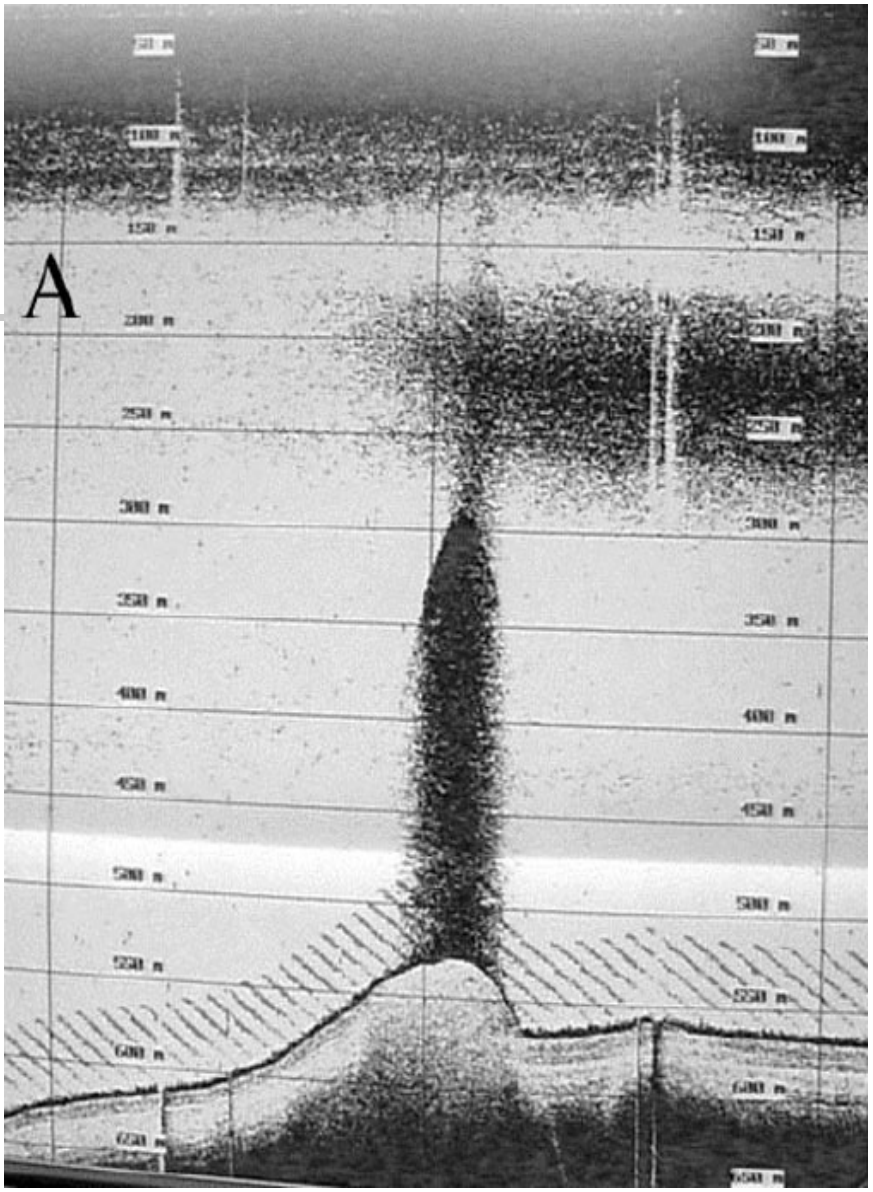
- Downward carbon flux
  - Supply carbon to deep communities & corals
  - Concerns of ocean acidification, particularly for deepwater corals
  - Shallower ocean areas affected first but deep ocean will be impacted after delay

- Upward carbon flux
  - How relevant to carbon budget in the Gulf?
  - Not typically included in greenhouse gas budget
    - Methane seeps (25 times more potent than CO2 as greenhouse gas)
    - Oil seeps that reach the surface
    - Methane flux from potential hydrate disassociation
    - Biological impacts from water column chemosynthetic bacteria production and food web biomass effects unknown

Seeps



3D seismic acoustic high amplitude anomaly on GOM seabed. Total of over 7,000 now known to exist below 200 m.



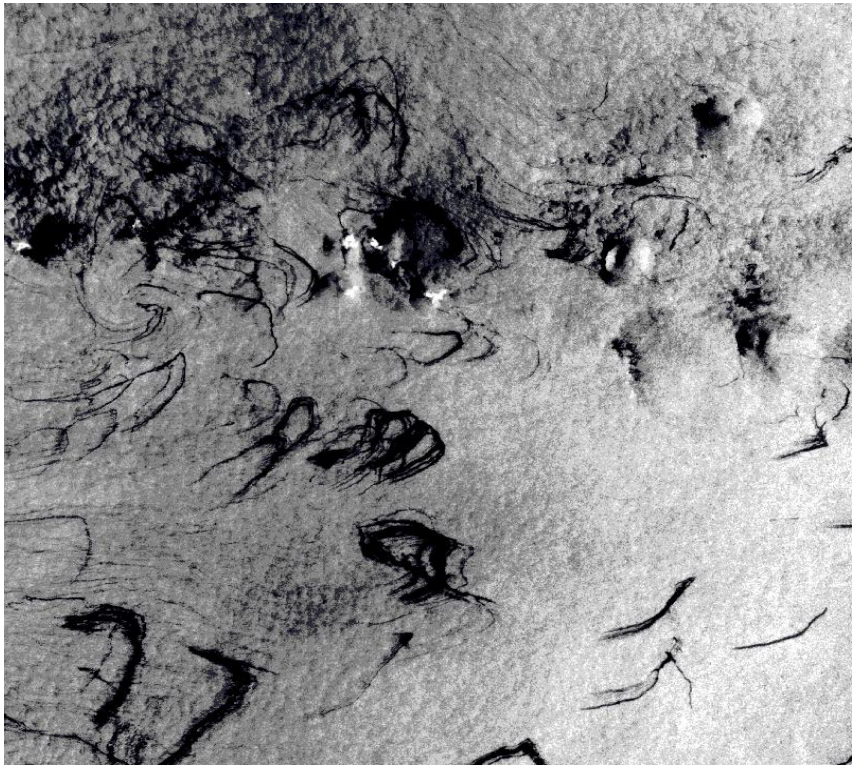
Methane seep documented by ship's echo sounder during MMS Chemo III study rising hundreds of meters

Seeps

Hundreds of perennial oil slicks documented. One estimate for subset of GOM seeps = 2,365,000 gallons/ year.

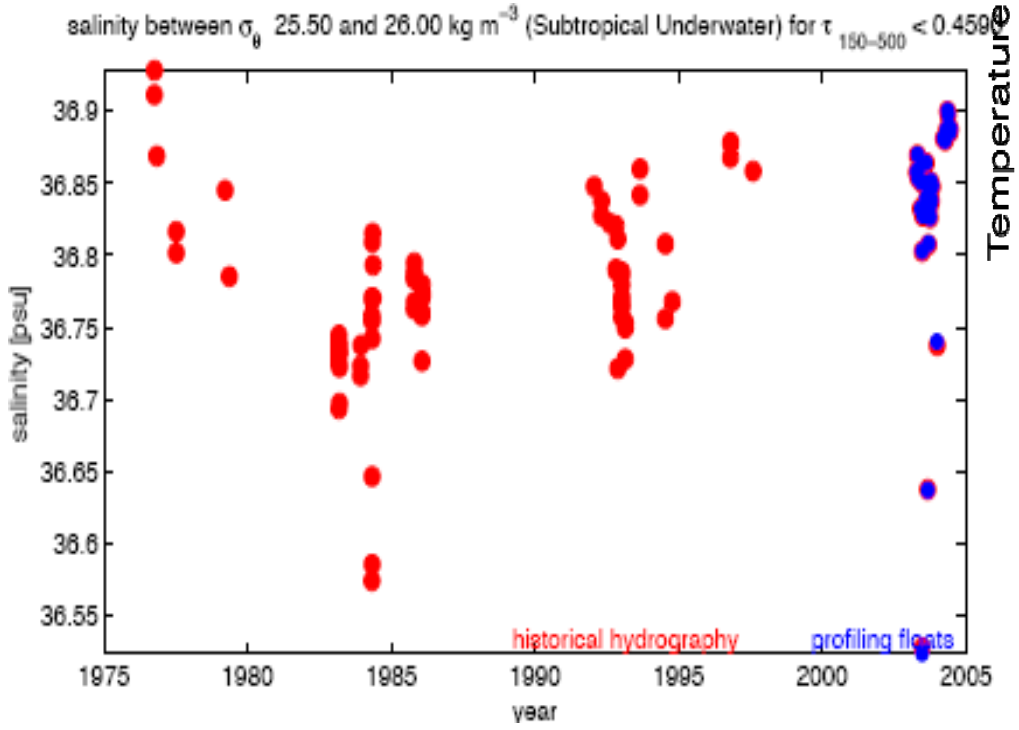
Methane seeps not visible from space.

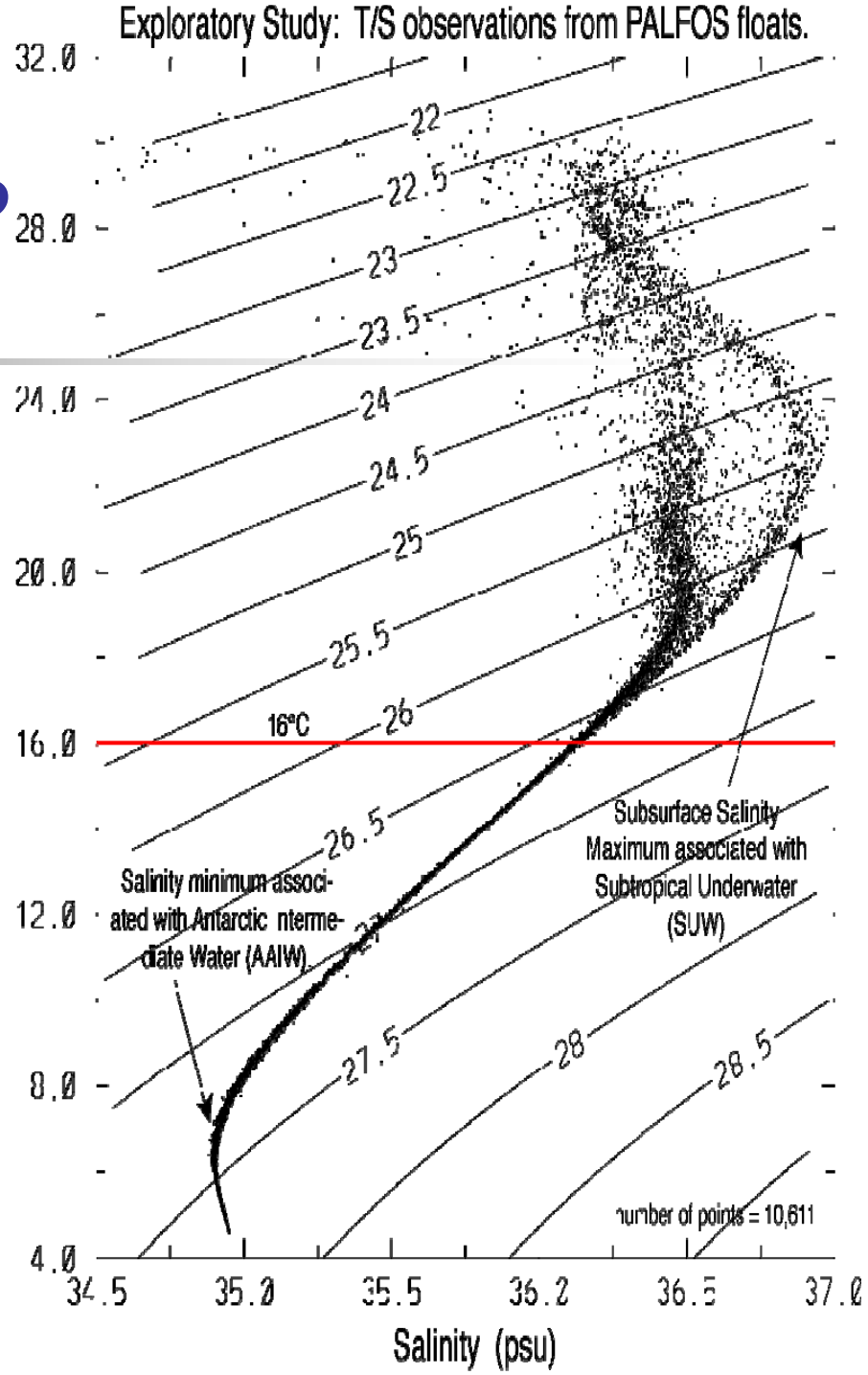
Oil droplets emerging from sediments and sticking to methane hydrate



Synthetic Aperture Radar of GOM from the European Space Agency ERS-1 satellite

Deep Salinity Change in the Gulf?





Possible Research?

- Bi-national full depth hydrographic surveys of the entire Gulf from two vessels. Measure T & S, nutrients, O_2, DIC, TOC, and other relevant elements.
- Detect temporal trends, update long-term database for the Gulf, and study vertical fluxes.
- Provide temporal conditions for circulation and bio-physical models.