Characterization of particulate organic carbon from water column in the Gulf of Mexico

1. ABSTRACT

Stable isotopic carbon analysis ($\delta^{13}C_{POC}$) was used to characterize the particulate organic carbon (POC). Scanning electronic microscope (SEM) images were supplemented with this study. Samples were collected from the abyssal plain, the continental slope, and the Campeche canyon at six depth levels in the water column with the objective to describe the POC components exported to deep in a stratified tropical ocean. The POC $\delta^{13}C$ values ranged from -25.39 to -20.95 ‰ within the interval of marine planktonic values (-18.00 ± 30.5 ‰). The Campeche canyon’s showed significant differences (ANOVA; 4, 98, p=0.01). Differences were recorded in surface and bottom samples in the three areas. The isotopic values in this study were $\delta^{13}C$ depleted with distance from the coast which differs than previous studies were POC discussed in the abyssal plain, the diatoms images the continental slope and dynoflagellates dominate the abyssal plain, the diatoms images the continental slope and dynoflagellates the Campeche canyon with particle sizes ranging from 5 to 50 µm. The isotopic differences were related to the origin and depletion due to residence time in the water column.

2. Methods

A) Cruises SIGSBEE.5 and PROMEBIO 8, B/O Justo Sierra
B) MCD-PNFS-300 de biophysical Instruments Fluorescente Profiler
C) CTD Delta Mark III C - 24 WOCCE General Oceanic
D) Rossette: 6 levels in the water column; 5L
E) Acidified HCL 1N 48 h dried to 60ºC 24 h
F) Tin capsule: EAI NA 2500 coupled to FinniganDelta Plus XL MS
G) Reference CO$_2$: NBS-11, to Pee Dee Belemnite ($\delta^{13}C_{VPDB}$) (Craig 1953)

3. Objective

- To evaluate the changes in POC $\delta^{13}C_{VPDB}$ composition and providing SEM images.
- To evaluate the changes in POC $\delta^{13}C_{VPDB}$ composition in six levels of the water column.
- To correlate the changes observed with the environmental conditions in the three areas.

4. Study Area

![Study Area Diagram]

5. Results

![POC Composition Graph]

POC $\delta^{13}C_{VPDB}$ composition and variability of values between Study areas' stations. n= 104, F(18, 85) = 1.74, p=0.04, confidence interval 0.95.

6. Conclusions

- The $\delta^{13}C_{VPDB}$ Signatures of the POC in the upper layers of the water column in the three areas were typical of phytoplankton.
- The $\delta^{13}C_{VPDB}$ values of the bottom water samples were impoverished and were related to the extended residence time in the water column.
- The abyssal stations were characterized by the presence of coccolithophores in contrast to the stations on the continental slope and Campeche canyon that were characterized by diatoms.

7. Ongoing project related to Carbon Fluxes.

Three sediment traps at 500 m above bottom were deployed on moorings equipped with current meters and ADCPs in the SW Gulf of Mexico in August 2004. Rotating frequency: 19 days. Mooring colaboration: CICESE.

8. References