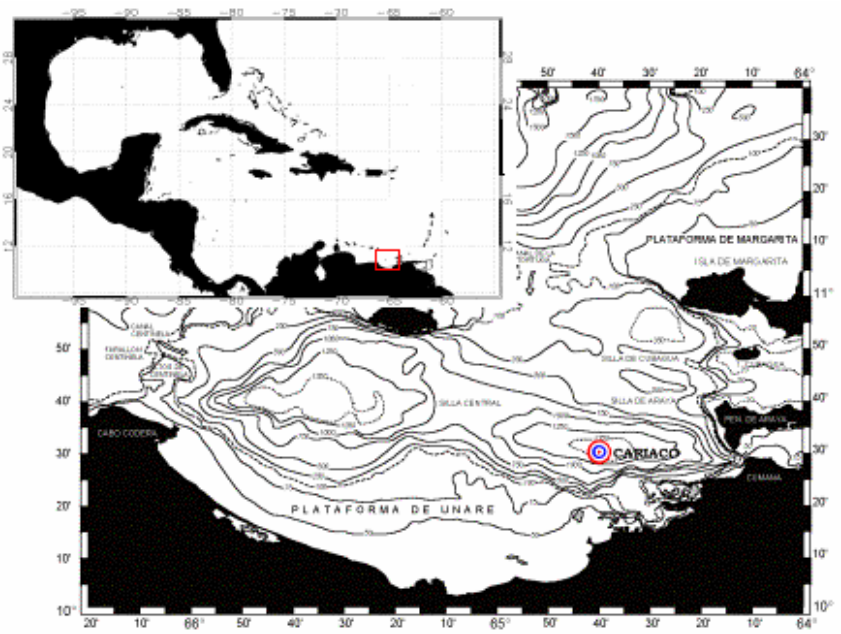
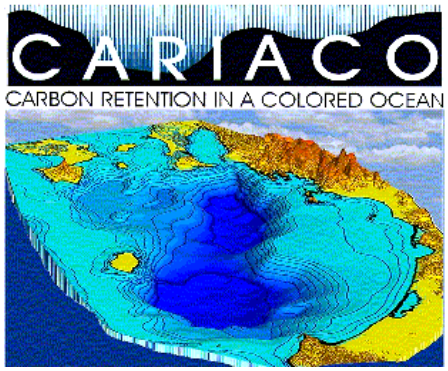
Carbon Retention In A Colored Ocean Project (CARIACO)



Since November 1995, the relationship between surface primary production, physical forcing variables, and the settling flux of particulate carbon have been studied at the CARIACO station (10.5°N, 64.67°W), in order to better understand the link between the ocean surface and the sinking flux of particulate carbon in the Cariaco Basin, thanks to monthly oceanographic cruises and moorings.



The Cariaco Basin has long been the center of attention of scientists trying to explain paleoclimate. Now, the CARIACO program provides a link between the sediment record, and processes and fluxes near the surface of the ocean. The Cariaco Basin is a large and deep coastal basin contained within the Venezuelan continental shelf. It is bound to the north by a sill connecting Margarita Island to Cabo Codera, at a mean depth of about 100 m with two channels breaching this sill. Because the sill restricts water motion and the lateral flux of material below about 140-m depth, Cariaco forms a natural sediment trap within a continental shelf. This depression shows marked seasonal and interannual variation in hydrographic properties and in primary production, and records climate change within layers of sediment. The Cariaco Basin experiences marked seasonal upwelling, a source of nutrients which leads to vigorous phytoplankton growth near the surface. Much of the resulting organic material remains ungrazed and sinks. As the turnover of basin waters is slow, the decomposition of the sinking material leads to permanent anoxia in intermediate waters. Varved sediments that accumulate within the bottom anoxic waters then provide a detailed record of annual to decadal scale change over several dozen millenia.

The results from the CARIACO time-series demonstrate that production along continental margins in the tropics can be substantial, and redefines earlier estimates as being minimum values. The oxic/anoxic interface is a region of vigorous carbon cycling. This carbon is not entirely provided by surface-derived export production. While bulk carbon delivery to the deepest trap appears to conform to open water predictions, the composition and source terms for this material are not well defined. Rapid heterotrophic activity at the oxic/anoxic interface suggests introduction of fresh labile organic matter at depth either through vertical migrators or possibly through in situ production by chemoautotrophs. In a system like the Cariaco Basin, the upwelling process brings

deep water enriched in dissolved inorganic carbon to the surface, and CO_2 fugacity increases as the water enters the euphotic zone. The Cariaco Basin remained near or above the atmospheric saturation partial pressure nearly at all times, in spite of the high primary production and high carbon export in the form of sinking organic particulate flux. Viewed as a purely vertical system, the Cariaco upwelling system is thus a source of CO_2 to the atmosphere on a year-round basis. However, the significance of the downward flux of particulate carbon at this continental margin lies in its role as a sink for CO_2 captured within the North Atlantic and transported via subsurface water masses.

Remarks on Data Sharing Policy

In the past, basic hydrographic, biological, and chemical data collected under the CARIACO program have been routinely delivered both to the US National Oceanographic Data Center and to NASA's SeaBASS database at monthly to semi-annual intervals, depending on the dataset. The objective is to make the data from core observations available as quickly as possible. Data should be openly shared, particularly among colleagues interested in understanding the Cariaco Basin sedimentary system and processes acting there. Data will be posted immediately upon completion of quality control processes, and will be shared freely by the CARIACO PIs. The timeframe for posting will vary with each of the specific data sets, but basic hydrography are anticipated to be updated within a month after each cruise. In all cases, data submission will be openly available to the broad scientific community as soon as possible, but no later than the two-year post-cruise timescale required by the funding sponsors. In the past, sediment trap samples have been made available to other investigators for ancillary studies. When possible, half of each sample is archived for future work. To date, material was provided to colleagues for the studies of trace metal concentrations in foraminiferal carbonates, coccolithophore fluxes, and trace element ratios in lithogenic material. The open sharing policy for trap samples will be continued as long as sufficient material is available. Third parties using the CARIACO data are encouraged to consider joint analysis efforts with members of the CARIACO group. This policy should augment the knowledge base generated by the core CARIACO observations.

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Additional information on CARIACO is available at **imars.marine.usf.edu/cariaco/index.html**.