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Preface

Biogeochemistry and cycling of carbon in the northwest Atlantic continental margin: findings of the Ocean Margins Program

Large-scale interdisciplinary efforts aimed at studying the cycling and fluxes of carbon in the northwest Atlantic continental margin, specifically in the Middle Atlantic Bight (MAB), have been ongoing for approximately the last 20 years through a variety of different programs, initially funded primarily through the US Department of Energy. These programs had their beginnings in the need for better understanding the movement and fate of both anthropogenic (e.g., radionuclides, trace metal and organic contaminants) and natural (carbon and other biogenic elements) materials between the continents and the oceans, with particular interest in the impact of human activities in modulating the fluxes of these materials. Because both inorganic and organic contaminants often associate most strongly with particulate phases, the earliest of these programs (Shelf Edge Exchange Programs (SEEP) I and II) focused the bulk of their efforts on estimating inventories, transformations, and fluxes of particulate phase materials. This emphasis on particulates was a logical one from the perspective of contaminants and particle-associated biogenic elements. However, it became obvious over the course of SEEP-I and SEEP-II that from the standpoint of biogenic elemental cycling, the largest pool of organic C, N and P, dissolved organic matter, also needed to be considered if accurate mass balance and flux estimates were to be obtained, and if fluxes at the continental margins were to be placed in context with both river transport and open ocean fluxes. In addition, our contemporary understanding of the role of ocean margins as net autotrophic or net heterotrophic systems (i.e., as net sources or sinks of CO_2) has long been debated through the use of indirect methods, i.e., ecosystem level and elemental mass balance models. With the advent of numerous innovations in field and experimental approaches and analytical instrumentation throughout the 1990s, including both in situ and satellite remote sensing, new possibilities arose for better constraining the qualitative and quantitative roles of dissolved organic and inorganic carbon and associated biogenic elements in continental shelf and slope elemental budgets.

Thus, the Ocean Margins Program (OMP) was born, with a primary mission to evaluate *all* the major pools, biogeochemical transformations, and fluxes of carbon (and associated biogenic elements) in its various forms more fully than any previous program conducted in continental shelf and slope waters and sediments. The OMP was the largest coastal ocean program, and one of the largest single-system oceanographic programs, ever undertaken. The MAB is arguably now the single most intensively studied ocean margin system in the world from physical, biological, and geochemical perspectives. The program employed the scientific expertises and skills of up to 71 PIs and numerous additional research associates and graduate students from 1992 to 1998. These researchers utilized many months' worth of total ship time on seven major oceanographic research vessels and submersibles, with the majority of the field effort being concentrated between 1993 and 1996. The field effort embraced four

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major components: (1) whole-shelf and upper slope "surveys" extending from Cape Cod to Cape Hatteras, intended to evaluate the major inventories, sources, and sinks of organic and inorganic carbon pools, (2) hydrographic surveys and the deployment, maintenance and retrieval of an array of between 23 and 26 highly instrumented (including both hydrographic and chemical sensors) moorings, distributed between the mouth of Chesapeake Bay and Cape Hatteras, (3) intensive "process-based studies" focusing on microbial food-web structure and function, primarily in the southern part of the MAB between Chesapeake Bay and Cape Hatteras, in the region of the moored array, and (4) outer shelf and slope sediment biogeochemical and benthic flux studies, also in the southern part of the study area.

The 19 basic research papers presented in this special volume of *Deep-Sea Research-II* relay some of the latest findings highlighting our basic understanding of the role that ocean margins occupy in their position between the continents and the open ocean. The interested reader is advised that these papers represent only part of the total number of published peer-review papers arising from the OMP—many of the previously published and forthcoming papers in other journals may be found in the bibliographies of the papers contained in this issue.

The Ocean Margins Program was guided by the vision of George Saunders and Curtis Olsen of the Department of Energy. The assembly and synthesis of the data presented in the papers in this special volume resulted from support provided by the US JGOFS Synthesis and Modeling Program, through the encouragement of Don Rice of NSF's Chemical Oceanography Program. The skills and dedication of the captains and crews of the various research vessels (R/Vs *Cape Hatteras*, *Columbus Iselin*, *Endeavor*, *Gyre*, *Oceanus*, *Seward Johnson*, and *Johnson Sea Link*) were instrumental in successfully carrying out the formidable large-scale field effort. Finally, *Deep-Sea Research-II* Editor-In-Chief John Milliman and Elsevier Ocean Sciences Publishing Editor Kristien van Lunen provided valuable guidance and support throughout the various phases of preparation of this special volume.

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