BOOK REVIEW

The Global Coastal Ocean: Interdisciplinary Regional Studies and Syntheses

Allan R. Robinson and Kenneth H. Brink, Editors
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Coastal zones are where land, rivers, atmosphere, seas, sediments, and biota meet, and thus where spatial and temporal heterogeneity is substantial. This volume of *The Sea* complements and supplements volumes 10 and 11, as well as Part B of Volume 14, which deal generally with the physical oceanography of global coastal oceans, and Volume 13, which examines multiscale interdisciplinary processes on sediment, biogeochemical, and ecosystem dynamics. Because of extreme complexity, however, analyzing and synthesizing in an interdisciplinary manner observations from global coastal oceans is difficult. Because most worldwide observation systems are complicated, many global programs, such as the System for Analysis, Research and Training for Global Change Research (START), the Global Carbon Project (GCP), and the Monsoon Asia Integrated Regional Study (MAIRS), have all promoted regional research for achieving the final goal of global synthesis. This volume takes the same approach.

Part 1 of this volume consists of four chapters on panregional syntheses for western (Chapter 1), eastern (Chapter 2), and polar ocean boundaries (Chapter 3), in addition to semienclosed seas, islands, and Australia (Chapter 4). These four chapters are constructed upon and summarize information presented in the 15 chapters in Part 2 on regional interdisciplinary oceanography.

To this reviewer, the most significant conclusion from this book is that riverine input of dissolved nutrients is of local significance only. The book provides proof that the role of subsurface water intrusion from offshore is pivotal in terms of nutrient supply for extensive areas of continental shelves, and that enhanced biological activity enables coastal and marginal seas, particularly those outside equatorial areas, to absorb atmospheric carbon dioxide (CO_2), which is subsequently transferred to the open ocean.

Equally important is that in response to increasing anthropogenic perturbations, the eutrophication-induced alterations in biogeochemical cycles and transformations of carbon, nitrogen, phosphorous, sulfur, and silicon in addition to other trace elements have been consistently identified in the book. Added to these processes, the book gives clear evidence that food web structures, when affected by internal and external forcings associated with natural and anthropogenic changes, may undergo nonlinear changes within their existing states. Conversely, these web structures may experience regime shifts or an abrupt switch to another state with minimal warning of impending changes. Whether humans are pushing coastal environments over thresholds should be a matter of great concern, and the book discusses these issues.

It is unclear how long it took to publish the volume, but some chapters contain few important references published since, say, 2003. Many figures likely submitted in color but printed in black and white are difficult to read. Less trivial is an oversight in Chapter 1, where an erroneous description of the East China Sea as an inland sea may generate confusion. The authors of Chapter 16 identified the Sea of Japan as the Japan/East Sea, which is indeed an inland sea. On the other hand, the East China Sea is almost open to the Pacific Ocean.

Having said this, this volume is a great success in providing a wealth of information. More importantly, given the complexity of coastal environments, information in the volume is well synthesized and certainly lives up to the reputation of *The Sea*.

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AGU JOURNAL HIGHLIGHTS

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Ice-associated algal blooms and their impact on biological production in the southeastern Bering Sea In the Pacific Ocean, water temperatures in the west cycle between warm and cold phases while eastern waters experience the opposite pattern. Called the Pacific Decadal Oscillation (PDO), the 20–30-year cycle is superimposed on global warming and associated northern ice cover reductions. Noting that the high biological productivity of the southeastern Bering Sea shelf is modulated by seasonal sea ice cover, *Jin et al.* developed an ecosystem model of the area which correctly reproduced blooms observed in 1997 and 1999. The model suggests that blooms, seeded by algae released from melting sea ice, can thrive if melting and resulting low-salinity stratification at the surface are not followed by wind-driven mixing. Changes in bloom patterns between the 1997 and 1999 events resulted from the PDO switching to a cold regime in the east during the early 21st century. Further, the authors noted that the bloom's timing and magnitude, as well as species shifts associated with fluctuating ice margins coupled with gradual ecosystem changes associated with global warming, can dramatically alter the Bering Sea ecosystem. (*Geophysical Research Letters*, doi:10.1029/2006GL028849, 2007)

Coralline alga gives first marine record of subarctic climate change in the northern Pacific Ocean Recent changes in the subarctic climate of the northern Pacific Ocean had dramatic effects on ecosystems and fishery yields, but these climate dynamics are poorly understood due to the absence of century-long high-resolution marine records that far north. Noting that waters in the northern Pacific house species of long-lived coralline red algae, *Halfar et al.* used the calcitic skeleton of one alga to generate a 117-year record of marine climate history based on skeletal bands which, similar to tree rings, represent yearly cycles of growth. Representing a newly discovered climate archive, the alga's skeleton contained oxygen isotope patterns that indicate freshening and warming of surface waters after the middle of the 20th century. The time series developed correlates with the decades-long Pacific Decadal Oscillation and the shorter duration El Nino-Southern Oscillation (ENSO). Though the western Bering Sea/Aleutian Island region is thought to be outside the area of significant marine response to ENSO, the authors proposed that an ENSO signal is transmitted through the Alaskan Stream from the Eastern North Pacific, an area of known ENSO teleconnections. (*Geophysical Research Letters*, doi:10.1029/2006GL028811, 2007)

—MOHI KUMAR, Staff Writer