

Preface

The number of coastal hypoxic zones has been increasing at an exponential rate since the 1960s, and there are currently more than 600 documented hypoxic zones in the estuarine and coastal waters worldwide. These include the well-studied large systems affected by riverine inputs, as well as increasingly important deeper-water ocean shelf oxygen minimum zones and small, shallow coastal systems. Hypoxia causes the loss of habitat and the spatial displacement of plankton, large invertebrates, and fish, and is often associated with mass mortalities of marine organisms that live on or near the bottom. In addition to being a widespread environmental problem, coastal hypoxia influenced by riverine inputs is also of great socioeconomic and political interest because of its association with agricultural fertilizer activities in the watershed. There will be increasing demands for predicting the ecological responses to hypoxia in order to quantify the ecological benefits and costs of management actions and to express the simulated effects of coastal management and climate change in terms of direct relevance to managers and the public. Numerical models can provide the needed information for understanding hypoxia and ensuring effective management, and this book provides a snapshot of representative modeling analyses of coastal hypoxia and its effects.

This book is a collection of case studies presented at hypoxia modeling sessions that editors have organized over the past four years at meetings of the Association for the Sciences of Limnology and Oceanography and the Coastal and Estuarine Research Federation. Chapter authors include senior scientists who have studied hypoxia for many years, but also, importantly, many junior scientists who bring specialized knowledge on selected hypoxia modeling topics. This book consists of 15 chapters that are broadly organized around three main topics: (1) Modeling of the physical controls on hypoxia, (2) Modeling of biogeochemical controls and feedbacks, and (3) Modeling of the ecological effects of hypoxia. The final chapter is a synthesis chapter that draws generalities from the earlier chapters, highlights strengths and weaknesses of the current state-of-the-art modeling, and offers recommendations on future directions. We hope that the “physics to fish” approach of this book will make it a useful reference for oceanographers, environmental scientists, resource managers, and graduate students.

All chapters in this book underwent standard peer review typical of scientific journals, with each receiving multiple, anonymous reviews and with subsequent revisions monitored by one of the editors. We thank the many people that provided reviews on the chapters. We are grateful to Janet Slobodien, executive editor, Ecology and Evolutionary Biology, Springer, for the invitation to write a book on coastal hypoxia modeling and Center for Sponsored Coastal Ocean Research, National Oceanic and Atmospheric Administration, for supporting many of the hypoxia modeling studies discussed in this book.

Baton Rouge, USA
Baton Rouge, USA
College Station, USA
Halifax, Canada

Dubravko Justic
Kenneth A. Rose
Robert D. Hetland
Katja Fennel

Modeling Coastal Hypoxia

Numerical Simulations of Patterns, Controls and Effects
of Dissolved Oxygen Dynamics

Justic, D.; Rose, K.A.; Hetland, R.D.; Fennel, K. (Eds.)

2017, XII, 433 p. 139 illus., 73 illus. in color., Hardcover

ISBN: 978-3-319-54569-1