

Book review

Numerical Modelling: Applications to Marine Systems, edited by J. Noye (Elsevier Science Publishers, 1987) ISBN 0 444 70305 5. Pp xii + 296, Dfl 150.00.

This volume is based on material presented at a workshop on numerical modelling of marine systems held in February 1986 in Adelaide. It comprises 11 articles based on papers presented at the workshop, and two further articles drawn from specialised sessions on open boundary conditions and transport of passive pollutants (the preface and list of contents do not inform the reader which two papers are derived from the specialised sessions). The format and overall presentation of the book are pleasing, and it is apparent that it draws heavily on the efforts and inspiration of the convener and editor, John Noye.

The title ostensibly suggests contributions from a wide range of space and time-scales but in practice the focus is on short-term variability of coastal regions, seas and straits. Nevertheless, I was able to identify several numerical problems which have counterparts in global climate models, an area with which I am more familiar. The first seven papers deal with a variety of approaches to wind and tidally-driven coastal flows. These papers are complemented by two articles on open boundary condition formulations. The final four papers address models for the transport of passive tracers and pollutants. The detailed and systematic analyses of numerical techniques serve to unite the collection with a common theme and provide the essential strength of the volume.

Alan Davies leads the presentations with a review of recent developments in marine modelling techniques. He concentrates on the spectral approach whereby the Galerkin method and selected basis functions are used to yield an elegant and economical model for current profiles. Proctor pursues this approach in a model of the Irish Sea, discussing the vertical viscosity parametrisation and comparing model results with observations. Hearn and Hunter prefer the

simpler two-dimensional model for their study of the southwest Australian coast, a region which is characterised by the dominance of wind-driven flow. Nunes departs somewhat from the theme of the book by presenting observations of convection in coastal oceans. Black gives a detailed description of the design of a sediment transport model, illustrating its application with data from a harbour site. Craig models internal tides using the method of characteristics to resolve vertical structure. Jung et al. compare established finite difference methods for vertical structure with the newer Galerkin methods discussed previously by Davies and Proctor (perhaps these papers should have been arranged together). The papers by Arnold and by Bills and Noye address the ever important problem of specification of the open boundary conditions for coastal models. The discussion is illustrative and extensive, going into some detail on the various options that are available (perhaps bordering on excessive).

The remainder of the volume is devoted to transport models, with three papers by Noye on aspects of the solution of the transport equation for one and two-dimensional problems, and a paper by Hunter on the utility of the Lagrangian particle technique. Noye begins with a comprehensive review of methods for representing advection (Lagrangian, Eulerian, upstream, flux-corrected, etc.), diffusion and for time-stepping in finite difference and finite element schemes. The article approaches the form of a lecture with extensive references to the literature but is perhaps too detailed in parts for a scientific volume. Noye's second paper concentrates on the one-dimensional problem while the third examines various time-splitting techniques. The Lagrangian particle technique contrasts nicely with the Noye method and Hunter is able to demonstrate superiority for certain cases.

Overall this book contains a number of illustrative and interesting papers. The reviews, analyses and detailed bibliographies should be useful for researchers working within the field and for readers less familiar with the research area. The demonstration of various techniques 'in action' accompanied by evaluations of performance are particularly useful in this respect. The material pertains to a narrow region of the spectrum of

numerical models of marine systems, but is of good quality with few typographical errors. The book will satisfy any researcher wishing to get basic details on the various approaches used in coastal modelling, but may prove too confined for those researchers seeking knowledge of the cur-

rent state of numerical modelling for marine systems as a whole.

Neville Smith

Neville Smith, of the Australian Bureau of Meteorology Research Centre, has research interests in large-scale ocean models.