Book review

CONTEMPORARY ISSUES IN ESTUARINE PHYSICS

Arnoldo Valle-Levison. Cambridge University Press, 2010, ISBN 978-0-521-89967-3, £70·00, 326 pp.

This book comprises 10 'Review' chapters on dynamics and mixing in estuaries, each written by a leading USA expert (originating from a workshop held in 2007). Topics range from tidal propagation, saline intrusion, wind- and density-driven circulation through to offshore plumes – with a concentration on 'low flow' (stratified) systems. While the mathematical derivations may challenge most non-experts, the associated backgrounds to theoretical derivations and generic interpretations are both insightful and inspiring. This is not a simple 'cook-book' providing ready formulae but an invaluable reference work linking (and explaining) established theories through to the latest advances in research.

The book begins with a chapter on estuarine classification, linking the earliest morphological descriptions of Pritchard through stratification diagrams to recent publications introducing Ekman and Kelvin numbers. The second chapter on salinity structures reviews analytical solutions and extends the conventional Hansen and Rattray (HR) framework through to more recent schemes based on tidal and river velocities. The third chapter emphasises the impact of morphology on tidal

propagation. While the details (here and elsewhere) may prove taxing, the rewards (e.g. Table 3.3) are invaluable. The fourth chapter explores interactions between tidal currents and salinity structure; again painstaking detail is rewarded by an insightful deciphering of the HR framework. The fifth chapter examines the nature and influence of 'secondary circulation' – conclusively demonstrating the misnomer involved. Analytical solutions for tidal propagation in open bays are reviewed in the sixth chapter. The seventh chapter on mixing explains with elegant simplicity the fundamental pioneering work of Fischer. Chapter eight explains, via analytical solutions, dimensionless numbers and case studies, why modelling of offshore plumes remains problematic. Chapter nine explores the combined influences of temperature and salinity on mixing in low-flow estuaries. After being overwhelmed by the progress reported above in understanding dynamics and mixing in estuaries, the final chapter provides a reminder of the challenges ahead in understanding water quality issues.

In summary, the excellence of every chapter makes this an outstanding reference book for any researcher interested in estuarine physics.

DAVID PRANDLE