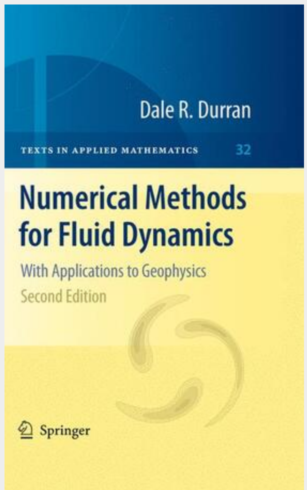
Durran

Numerical Methods for Fluid Dynamics

With Applications to Geophysics

This scholarly text provides an introduction to the numerical methods used to model partial differential equations, with focus on atmospheric and oceanic flows. The book covers both the essentials of building a numerical model and the more sophisticated techniques that are now available. Finite difference methods, spectral methods, finite element method, flux-corrected methods and TVC schemes are all discussed. Throughout, the author keeps to a middle ground between the theorem-proof formalism of a mathematical text and the highly empirical approach found in some engineering publications. The book establishes a concrete link between theory and practice using an extensive range of test problems to illustrate the theoretically derived properties of various methods. From the reviews: ".the books unquestionable advantage is the clarity and simplicity in presenting virtually all basic ideas and methods of numerical analysis currently actively used in geophysical fluid dynamics." Physics of Atmosphere and Ocean

This book is a major revision of Numerical Methods for Wave Equations in GeophysicalFluid Dynamics; the new title of the second editionconveysits broader scope. The second edition is designed to serve graduate students and researchers studyinggeophysical?uids, whilealso providinga non-discipline-speci?cintrod- tion to numerical methods for the solution of time-dependentdifferential equations. Changes from the ?rst edition include a new Chapter 2 on the numerical solution of ordinary differential equations (ODEs), which covers classical ODE solvers as well as more recent advances in the design of Runge–Kutta methods and schemes for the solution of stiff equations. Chapter 2 also explores several characterizations of numerical stability to help the reader distinguish between those conditions su- cient to guarantee the convergenceof numerical solutions to ODEs and the stronger stability conditions that must be satis?ed to compute reasonable solutions to ti- dependent partial differential equations with ?nite time steps. Chapter 3 (formerly Chapter 2) has been reorganized and now covers ?nite-difference schemes for the simulation of one-dimensional tracer transport due to advection, diffusion, or both.



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