
REVIEWED BY R. D. COOK


The collection centers around the development of variational methods in continuum mechanics and their adaptation to finite-element methods. The papers are in English. They have been retyped from journals in camera-ready format.

The appeal of the book is to those who study fundamentals and the theory of computational methods. The papers are clearly written and are original and significant contributions.


REVIEWED BY S. LEIBOVICH

Geophysical fluid mechanics, the study of fluid motions occurring naturally in the earth’s interior, oceans, and atmosphere, emerged as a distinct and vital subject in the 1960’s. The span of the scales of interest to the field is vast, ranging from centimeters such as capillary waves, to those on a planetary scale.

Professor Pedlosky’s book rose from a five quarter series of courses at the University of Chicago, and covers the theory of those large-scale phenomena of importance to the oceans and atmosphere. These are motions characterized by, usually dominated by, the effects of Coriolis acceleration, and ultimately driven by buoyancy created by differential heating. The physics is complex, and the book builds the theory by first describing the effects of rotation on a fluid of constant density. This part of the theory, to which half the book is devoted, is itself rich in content; one encounters an impressive array of wave phenomena (Poincare, Kelvin, and Rossby waves), nearly frictionless flows (in the geostrophic approximation) controlled by boundary (Ekman) layers, and a wide variety of boundary layer/shear layer effects including western intensification of currents such as the Gulf Stream). Baroclinic effects—those due to density variations—are added in the second half of the book which includes a substantial chapter on stability. The author derives the governing equations, discusses the relevant scaling assumptions, and educes models for each class of effects with care and skill.

I particularly like the author’s insistence on physical interpretations and explanations of equations and their solutions, and useful insights abound. Almost all of the theory is linear—although resonant wave interaction is considered and there are occasional glimpses of other nonlinear effects. Perhaps this is appropriate for a beginning series of courses, but believe it is necessary to discuss the limitations of linear theory more explicitly.

The book is apparently intended to serve as a textbook for a series of graduate courses. It is unfortunate that the author elected not to include exercises. This is a significant detriment to its use as a textbook. Nevertheless, the book is the first available introduction to a subject which, until now, has been scattered in the meteorological and oceanographical literature. Its systematic exposition by Professor Pedlosky, who has made important contributions to the development of geophysical fluid dynamics, will make the subject much more accessible to those trained in mechanics, and is heartily welcomed.


REVIEWED BY W. S. LOUD

The method of averaging with systems of ordinary differential equations has many areas of application in mechanics. Because of this, the present book is a welcome addition to the literature on the subject. The book is written as a “handbook” on the method of averaging, and as such it succeeds very well. It is very definitely aimed at an applications-oriented audience, as is shown by two important features. Numerous, often complicated, examples are discussed in considerable detail. The necessary mathematical aspects are presented in a simple, clear, and insightful manner. Unless the German language is an insurmountable obstacle, this book should prove to be a very useful reference for perturbation techniques based on the method of averaging. The reviewer is very pleased to have this book in his library.

The book consists of an introduction and four chapters. The introduction gives an overview of the contents along with several examples and a description of the method of averaging.

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