Parameterization Schemes

Keys to Understanding Numerical Weather Prediction Models

David J. Stensrud

CAMBRIDGE

Paperback Re-issue

Numerical weather prediction models play an increasingly important role in meteorology, both in short- and medium-range forecasting and global climate change studies. Arguably, the most important components of any numerical weather prediction model are the subgrid-scale parameterization schemes. These parameterization schemes determine the amount of energy that reaches the Earth's surface; determine the evolution of the planetary boundary layer; decide when subgrid-scale clouds and convection develop and produce rainfall; and determine the influence of subgrid-scale orography on the atmosphere. The analysis and understanding of parameterization schemes is a key aspect of numerical weather prediction.

This is the first book to provide in-depth explorations of the most commonly used types of parameterization schemes that influence both short-range weather forecasts and global climate models. Each chapter covers a different type of parameterization scheme, starting with an overview explaining why each scheme is needed, and then reviewing the basic theory behind it. Several parameterizations are summarized and compared, followed by a discussion of their limitations. Review questions at the end of each chapter enable readers to monitor their understanding of the topics covered, and solutions are available to instructors at www.cambridge.org/9780521865401.

Parameterization Schemes: Keys to Understanding Numerical Weather Prediction Models will be an essential reference for academic researchers, meteorologists, weather forecasters, and graduate students interested in numerical weather prediction and its use in weather forecasting.

Cover illustration: simulated thunderstorms developing along and ahead of the dryline over central Oklahoma. This is a three-dimensional visualization of output from a numerical weather prediction model using 2km horizontal grid spacing valid at 2100 UTC 8 May 2003. Green isosurface outlines the 10g kg-1 values of water vapour mixing ratio, white isosurface outlines the cloud boundaries, and colors at the surface indicate terrain heights. Colors along the vertical cross-section at the back of the figure indicate the u-component wind speed. Visualization produced using the Vis5d+ software.

CAMBRIDGE
UNIVERSITY PRESS
www.cambridge.org

ISBN 978-0-521-12676-2

Cover designed by Hart McLeod