LECTURE NOTES ON THE DISCRETIZATION OF THE BOLTZMANN EQUATION

Editors

Nicola Bellomo

Politecnico di Torino, Italy

Renée Gatignol

Université Pierre et Marie Curie, France

Published by

World Scientific Publishing Co. Pte. Ltd.

5 Toh Tuck Link, Singapore 596224

USA office: Suite 202, 1060 Main Street, River Edge, NJ 07661 UK office: 57 Shelton Street, Covent Garden, London WC2H 9HE

Library of Congress Cataloging-in-Publication Data

Lecture notes on the discretization of the Boltzmann equation / editors Nicola Bellomo, Renée Gatignol.

p. cm. - (Series on advances in mathematics for applied sciences; v. 63) Includes bibliographical references.

ISBN 9812382259 (alk. paper)

1. Transport theory. 2. Finite element method. 3. Differential equations--Asymptotic theory. I. Bellomo, N. II. Gatignol, Renée. III. Title. IV. Series.

QC718.5.T7 L43 2003 530.13'8--dc21

2002038059

British Library Cataloguing-in-Publication Data

A catalogue record for this book is available from the British Library.

Copyright © 2003 by World Scientific Publishing Co. Pte. Ltd.

All rights reserved. This book, or parts thereof, may not be reproduced in any form or by any means, electronic or mechanical, including photocopying, recording or any information storage and retrieval system now known or to be invented, without written permission from the Publisher.

For photocopying of material in this volume, please pay a copying fee through the Copyright Clearance Center, Inc., 222 Rosewood Drive, Danvers, MA 01923, USA. In this case permission to photocopy is not required from the publisher.

This book is printed on acid-free paper.

Printed in Singapore by Mainland Press

CONTENTS

Preface	ix
Chapter 1.	From the Boltzmann Equation to Discretized Kinetic Models
Chapter 2.	Discrete Velocity Models for Gas Mixtures 17 C. Cercignani
Chapter 3.	Discrete Velocity Models with Multiple Collisions
Chapter 4.	Discretization of the Boltzmann Equation and the Semicontinuous Model 59 L. Preziosi and L. Rondoni
Chapter 5.	Semi-continuous Extended Kinetic Theory 97 W. Koller
Chapter 6.	Steady Kinetic Boundary Value Problems 133 H. Babovsky, D. Görsch and F. Schilder
Chapter 7.	Computational Methods and Fast Algorithms for Boltzmann Equations

viii Contents

Chapter 8.	Discrete Velocity Models and Dynamical Systems
Chapter 9.	Numerical Method for the Compton Scattering Operator
Chapter 10	Discrete Models of the Boltzmann Equation in Quantum Optics and Arbitrary Partition of the Velocity Space
List of Con	atributors