

HANDBOOK OF MATHEMATICAL FLUID DYNAMICS

Volume I

Edited by

S. FRIEDLANDER

University of Illinois-Chicago, Chicago, Illinois, USA

D. SERRE

Ecole Normale Supérieure de Lyon, Lyon, France



2002

ELSEVIER

Amsterdam • Boston • London • New York • Oxford • Paris •
San Diego • San Francisco • Singapore • Sydney • Tokyo

ELSEVIER SCIENCE B.V.
Sara Burgerhartstraat 25
P.O. Box 211, 1000 AE Amsterdam, The Netherlands

© 2002 Elsevier Science B.V. All rights reserved.

This work is protected under copyright by Elsevier Science, and the following terms and conditions apply to its use:

Photocopying:

Single photocopies of single chapters may be made for personal use as allowed by national copyright laws. Permission of the Publisher and payment of a fee is required for all other photocopying, including multiple or systematic copying, copying for advertising or promotional purposes, resale, and all forms of document delivery. Special rates are available for educational institutions that wish to make photocopies for non-profit educational classroom use.

Permissions may be sought directly from Elsevier Science Global Rights Department, PO Box 800, Oxford OX5 1DX, UK; phone: (+44) 1865 843830, fax: (+44) 1865 853333, e-mail: permissions@elsevier.co.uk. You may also contact Global Rights directly through Elsevier's home page (<http://www.elsevier.com>), by selecting 'Obtaining Permissions'.

In the USA, users may clear permissions and make payments through the Copyright Clearance Center, Inc., 222 Rosewood Drive, Danvers, MA 01923, USA; phone: (+1) 978 7508400, fax: (+1) 978 7504744, and in the UK through the Copyright Licensing Agency Rapid Clearance Service (CLARCS), 90 Tottenham Court Road, London W1P 0LP, UK; phone: (+44) 207 631 5555; fax: (+44) 207 631 5500. Other countries may have a local reprographic rights agency for payments.

Derivative Works:

Tables of contents may be reproduced for internal circulation, but permission of Elsevier Science is required for external resale or distribution of such material. Permission of the Publisher is required for all other derivative works, including compilations and translations.

Electronic Storage or Usage:

Permission of the Publisher is required to store or use electronically any material contained in this work, including any chapter or part of a chapter.

Except as outlined above, no part of this work may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without prior written permission of the Publisher. Address permissions requests to: Elsevier Science Global Rights Department, at the mail, fax and e-mail addresses noted above.

Notice:

No responsibility is assumed by the Publisher for any injury and/or damage to persons or property as a matter of products liability, negligence or otherwise, or from any use or operation of any methods, products, instructions or ideas contained in the material herein. Because of rapid advances in the medical sciences, in particular, independent verification of diagnoses and drug dosages should be made.

ISBN: 0-444-50330-7

First edition 2002

Library of Congress Cataloging-in-Publication Data

Handbook of mathematical fluid dynamics/edited by S.J. Friedlander, D. Serre.

p. cm.

Includes bibliographical references and index.

ISBN 0-444-50330-7

I. Friedlander, S. J. II. Serre, D. (Denis)

QA911 .H34 2002

532'.05-dc21

2002019382

British Library Cataloguing in Publication Data

Handbook of mathematical fluid dynamics

Vol. 1 edited by S.J. Friedlander, D. Serre

I. Fluid dynamics – Mathematics

I. Friedlander, Susan, 1946 – II. Serre, D. (Denis)

III. Mathematical fluid dynamics

532'.05'0151

ISBN: 0444503307

© The paper used in this publication meets the requirements of ANSI/NISO Z39.48-1992 (Permanence of Paper).

Printed in The Netherlands.

Contents

<i>Preface</i>	v
<i>List of Contributors</i>	ix
1. The Boltzmann equation and fluid dynamics <i>C. Cercignani</i>	1
2. A review of mathematical topics in collisional kinetic theory <i>C. Villani</i>	71
3. Viscous and/or heat conducting compressible fluids <i>E. Feireisl</i>	307
4. Dynamic flows with liquid/vapor phase transitions <i>H. Fan and M. Slemrod</i>	373
5. The Cauchy problem for the Euler equations for compressible fluids <i>G.-Q. Chen and D. Wang</i>	421
6. Stability of strong discontinuities in fluids and MHD <i>A. Blokhin and Y. Trakhinin</i>	545
7. On the motion of a rigid body in a viscous liquid: a mathematical analysis with applications <i>G.P. Galdi</i>	653
Author Index	793
Subject Index	807