Asymptotic Analysis and Singularities —Hyperbolic and dispersive PDEs and fluid mechanics

ADVANCED STUDIES IN PURE MATHEMATICS 47-1

Chief Editor: Toshitake Kohno (University of Tokyo)

Asymptotic Analysis and Singularities —Hyperbolic and dispersive PDEs and fluid mechanics

Edited by

Hideo Kozono (Tohoku University)
Takayoshi Ogawa (Tohoku University)
Kazunaga Tanaka (Waseda University)
Yoshio Tsutsumi (Kyoto University)
Eiji Yanagida (Tohoku University)

Mathematical Society of Japan

This book was typeset by $\mathcal{A}_{\mathcal{M}}S$ - $T_{E}X$ and $\mathcal{A}_{\mathcal{M}}S$ - $\mathcal{E}T_{E}X$, the $T_{E}X$ macro systems of the American Mathematical Society, together with the style files aspm.sty and aspmfm.sty for $\mathcal{A}_{\mathcal{M}}S$ - $T_{E}X$ written by Dr. Chiaki Tsukamoto and aspmproc.sty for $\mathcal{A}_{\mathcal{M}}S$ - $\mathcal{E}T_{E}X$ written by Dr. Akihiro Munemasa and aspm.cls for $\mathcal{A}_{\mathcal{M}}S$ - $\mathcal{E}T_{E}X$ provided by Tokyo Shoseki Printing Co., Ltd.

TEX is a trademark of the American Mathematical Society.

© 2007 by the Mathematical Society of Japan.

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without the prior permission of the copyright owner.

Edited by the Mathematical Society of Japan.

Published by the Mathematical Society of Japan.

Distrubuted by the Mathematical Society of Japan, the American Mathematical Society and the World Scientific Publishing Co., Ltd. Distributed exclusively in North America by the American Mathematical Society.

ISBN 978-4-931469-40-2

2000 Mathematics Subject Classification. Primary 35-06. Secondary 34-06, 37-06, 46-06, 76-06.

Advanced Studies in Pure Mathematics 47-1 Chief Editor

Toshitake Kohno (Univ. of Tokyo)

Editorial Board of the Series

YOSHIKAZU GIGA (Univ. of Tokyo) KI-ICHIRO HASHIMOTO (Waseda Univ.)

TOSHITAKE KOHNO (Univ. of Tokyo)

YOICHI MIYAOKA (Univ. of Tokyo)

SHUJI SAITO (Univ. of Tokyo) SADAYOSHI KOJIMA (Tokyo Inst. of Tech.)

KIMIO MIYAJIMA (Kagoshima Univ.)

MASAYOSHI TAKEDA (Tohoku Univ.)

PRINTED IN JAPAN by Tokyo Shoseki Printing Co., Ltd.

SHIHOKO ISHII (Tokyo Inst. of Tech.)

Мотоко Котані (Tohoku Univ.)

MASATOSHI NOUMI (Kobe Univ.)