Ex. PGS 1044

(EXCERPTED)

Marine Geophysics

Marine Geophysics

E. J. W. Jones
University College London

JOHN WILEY & SONS, LTD
Chichester · New York · Weinheim · Brisbane · Singapore · Toronto

National 01243 779777
International (+ 44) 1243 779777
e-mail (for orders and customer service enquiries): cs-books@wiley.co.uk
Visit our Home Page on http://www.wiley.co.uk
or http://www.wiley.com

Other Wiley Editorial Offices

John Wiley & Sons, Inc., 605 Third Avenue,
New York, NY 10158-0012, USA

WILEY-VCH Verlag GmbH, Pappelallee 3,
D-69469 Weinheim, Germany

Jacaranda Wiley Ltd, 33 Park Road, Milton,
Queensland 4064, Australia

John Wiley & Sons (Asia) Pte Ltd, 2 Clementi Loop #02-01,
Jin Xing Distripark, Singapore 129809

John Wiley & Sons (Canada) Ltd, 22 Worcester Road,
Rexdale, Ontario M9W 1L1, Canada

Library of Congress Cataloging-in-Publication Data

Jones, E.J.W.
Marine geophysics / E.J.W. Jones.
p. cm.
Includes bibliographical references and index.
ISBN 0-471-98693-3 (alk. paper).—ISBN 0-471-98694-1 (alk. paper)
1. Marine geophysics. I. Title.
QE501.J585 1999
551.46′084—dc21 98-47324
CIP

British Library Cataloguing in Publication Data

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

ISBN 0 471 98693 3 (hardback)
0 471 98694 1 (paperback)

Typeset in 9/11pt Times by Vision Typesetting, Manchester
Printed and bound in Great Britain by Bookcraft (Bath) Ltd, Midsomer Norton
This book is printed on acid-free paper responsibly manufactured from sustainable forestry, in which at least two trees are planted for each one used for paper production.

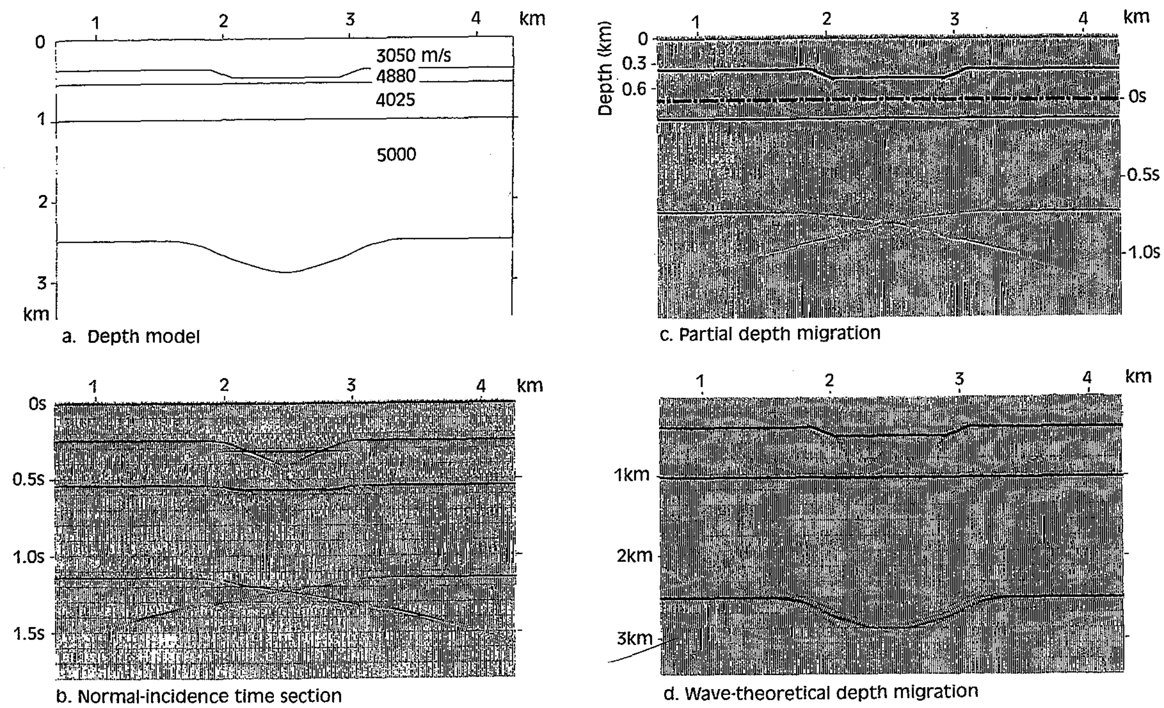

Figure 4.24 Wave-theoretical depth migration. (a) Model structure, with P-wave velocities given in m s^{-1}. The reflection coefficient between the 4880 m s^{-1} and 4025 m s^{-1} layers is zero. Reflection coefficients of all other interfaces are non-zero and identical. (b) Normal incidence time section calculated from the model structure. (c) Partial depth migration. Wave-theoretical migration has been carried out down to a source–receiver level of $\sim$ 750 m, shown by the dashed line. The shallow section is fully migrated in depth. The section below the dashed line is the time section that would be recorded with the source and receiver at a depth of 750 m. (d) Section obtained from wave-theoretical migration of record (b) (courtesy of Western Geophysical).

image seabed structure in more detail and with less ambiguity, many reflection surveys are carried out with a close grid of shot and receiver points spaced a few tens of metres apart so that seismic arrivals from a single point in the subsurface are recorded from different directions as well as at different source–receiver offsets (Figure 4.25). Such dense acquisition in offshore regions has been made possible by the development of accurate navigation systems and the use of multiple sources in conjunction with several receiver arrays (Section 5.9.4). Seismic returns are grouped into small cells or *bins*, data being included in a particular bin if a mid-point falls within that area of the subsurface. Data from each bin can then be stacked and migrated to produce a three-dimensional image of the subsurface.

Typically, the edges of a subsurface bin are 12.5 m in the inline direction of the survey and 25 m in the crossline. Digitization of the seismic trace at 2 ms provides a vertical sampling of 3 m for an average subsurface velocity of 3 km s^{-1}. The bin size is chosen so a high resolution of the subsurface can be achieved and aliasing during processing avoided, but it should not be so small that many bins are empty. Data points in the volume should be separated by less than one-half of a seismic wavelength. If f_{max} is the highest seismic frequency and α_{max} is the maximum dip, then the maximum separation Δx_s is (Sheriff and Geldart, 1995)

$$\Delta x_s \leq \frac{V}{4\ f_{max}\ \sin\alpha_{max}} \qquad (4.67)$$

Data within each bin should contain the same number of traces and the same uniform distribution of offsets but, in practice, the trace density is variable because the pattern of survey tracks is not ideal and also because of the presence of structural complexity in the subsurface. Traces for empty bins are normally generated by averaging data from an adjacent part of the subsurface. In some processing procedures empty bins are allowed to expand, usually in the crossline direction, until they