Mathematical Geophysics

A Survey of Recent Developments in Seismology and Geodynamics



edited by

N. J. VLAAR

G. NOLET

M. J. R. WORTEL

and

S. A. P. L. CLOETINGH University of Utrecht, The Netherlands

D. Reidel Publishing Company

A MEMBER OF THE KLUWER ACADEMIC PUBLISHERS GROUP



Dordrecht / Boston / Lancaster / Tokyo

CONTENTS

i

Pretace		
I	. SEISMOLOGY AND THREE DIMENSIONAL STRUCTURE OF THE EARTH	
	Waves in a 3-D Earth	
Chapter 1	G. Masters and M. Ritzwoller Low frequency seismology and three-dimensional structure - observational aspects.	1
Chapter 2	J.Park Free-oscillation coupling theory.	31
Chapter 3	K. Yomogida Surface waves in weakly heterogeneous media.	53
Chapter 4	R. Snieder On the connection between ray theory and scattering theory for surface waves.	77
Chapter 5	A. van den Berg A hybrid solution for wave propagation problems in inhomogeneous media.	85
	Large-scale inversion	
Chapter 6	P. Mora Elastic wavefield inversion and the adjoint operator for the elastic wave equation.	117
Chapter 7	B.L.N. Kennett and P.R. Williamson Subspace methods for large-scale nonlinear inversion.	139
Chapter 8	W. Spakman and G. Nolet Imaging algorithms, accuracy and resolution in delay time tomography.	155

vi CONTENTS

II. CONVECTION AND LITHOSPHERIC PROCESSES

Geomagnetism

Chapter 9	J. Bloxham The determination of fluid flow at the core surface from	
	geomagnetic observations.	189
	Mantle convection	
Chapter 10	G.T. Jarvis and W.R. Peltier Long wavelength features of mantle convection.	209
Chapter 11	F. Quareni and D.A. Yuen Mean-field methods in mantle convection.	227
Chapter 12	P. Machetel and D.A. Yuen Infinite Prandtl number spherical-shell convection.	265
Chapter 13	A.M. Forte and W.R. Peltier Lateral heterogeneity and the geoid: the importance of the surface kinematic constraints.	291
	Postglacial rebound	
Chapter 14	W.R. Peltier Lithospheric thickness, Antarctic deglaciation history, and ocean basin discretization effects in a global model of postglacial sea level change.	325
Chapter 15	M. Nakada and K. Lambeck Non-uniqueness of lithospheric thickness estimates based on glacial rebound data along the east coast of North America.	347
	Thermomechanical processes in the lithosphere	
Chapter 16	S.A.P.L. Cloetingh and M.J.R. Wortel On the mechanics of plate boundary formation.	363
Chapter 17	C.L. Angevine, S.R. Linneman and P.L. Heller Supercontinent breakup: effect on eustatic sea level and the oceanic heat flux.	389

Index

401