

# Contents

<b>1</b>	<b>Lithosphere Structure and Dynamics.</b>	<b>1</b>
1.1	Physical Model.	1
1.2	Discontinuities and Composition	4
1.3	Global Tectonics.	7
1.4	Forces Acting on the Plates	11
	References.	14
<b>2</b>	<b>Heat Conduction and Thermophysical Parameters.</b>	<b>17</b>
2.1	Thermophysical Parameters	17
2.1.1	Thermal Properties of Rocks.	17
2.1.2	Radiogenic Heat	20
2.2	Heat Conduction Equation	22
2.3	Thermal Conductivity Measurements	25
2.3.1	Divided Bar	25
2.3.2	Needle Probe.	27
2.3.3	Transient Divided Bar.	29
2.3.4	Data Compilation	31
2.4	Estimates of Thermal Properties	33
2.4.1	Mixing Models	33
2.4.2	In Situ Thermal Properties	35
2.5	Determination of Heat-Producing Elements	37
2.5.1	Laboratory Techniques	38
2.5.2	Secular Equilibrium.	40
2.5.3	Ground Spectrometry	41
2.5.4	Background Radiation.	42
2.5.5	Alteration Processes	43
2.5.6	Radioelement Concentrations and Heat Production.	44
2.6	Radiogenic Heat in Depth	45
	References.	48

<b>3 Thermal Structure</b>	53
3.1 Ground Surface Temperature	53
3.2 Geothermal Flow	56
3.2.1 Heat Release	56
3.2.2 Geothermal Flow Components	60
3.2.3 Marginal Basins	61
3.2.4 Thrust Sheets	63
3.3 Temperature Distribution in the Lithosphere	65
3.3.1 Continental Plate	65
3.3.2 Oceanic Plate	67
3.3.3 Ocean Floor Topography	70
3.4 Thermal Structure of the Deeper Interior	71
References	78
<b>4 Temperature and Magmatic Processes</b>	81
4.1 Melting Mechanisms	81
4.1.1 Solidus Intersection	81
4.1.2 Melting by Rifting	84
4.1.3 A Case Study of Magmatic Underplating	86
4.2 Rheological Behaviour	88
4.2.1 Temperature and Viscosity	89
4.2.2 Lava Flows	93
4.3 Upwelling Mechanisms	94
4.4 Solidification and Cooling	96
4.4.1 Lava Lake	96
4.4.2 Intrusive Igneous Bodies	98
4.4.3 Lava Cover	100
References	101
<b>5 Heat in the Groundwater Flow</b>	103
5.1 Background	103
5.2 Heat Advection	105
5.2.1 Vertical Flow	105
5.2.2 Two-Dimensional Flow	105
5.2.3 Péclet Number	107
5.2.4 Application to Borehole Temperature Data	107
5.2.5 Hydrothermal Systems	109
5.3 Thermal Convection	114
5.3.1 Rayleigh Number	114
5.3.2 Deep Carbonate Reservoirs	115
References	117

<b>6</b>	<b>Subsurface Temperature and Climate Change Reconstruction . . . . .</b>	<b>121</b>
6.1	Introduction . . . . .	121
6.2	Inversion of Borehole Temperature Data . . . . .	124
6.2.1	Thermal Data . . . . .	124
6.2.2	Ground Surface Temperature History . . . . .	125
6.2.3	Temperature Time Series . . . . .	127
6.3	Pre-observational Mean of Surface Air Temperature . . . . .	128
6.4	Forward Modelling . . . . .	130
6.4.1	Recent Temperature Variations . . . . .	130
6.4.2	Repeated Borehole Temperature Measurement . . . . .	132
	References. . . . .	134
<b>Index</b>	<b>. . . . .</b>	<b>137</b>

Geothermics

Heat Flow in the Lithosphere

Pasquale, V.; Verdoya, M.; Chiozzi, P.

2017, XI, 138 p. 60 illus., Softcover

ISBN: 978-3-319-52083-4