

Contents

Preface	5
List of Illustrations	7
List of Tables	13
1 Introduction	15
1.1 A Geomorphological Equation	17
1.2 Earth Materials	20
1.3 Endogenetic Processes	33
1.4 Exogenetic Processes	34
1.4a Weathering processes	34
1.4b Climate and surface processes	37
1.5 Processes and Systems	41
2 Drainage Basin Processes	44
2.1 Perspectives on the Drainage Basin	45
2.1a Drainage basin studies	46
2.1b Slope studies	47
2.1c The geomorphological equation applied to the drainage basin	48
2.1d Types of model	49
2.2 Processes in the Drainage Basin	51
2.2a Water movement	51
2.2b Mass movement	61
2.2c Sediment and solutes in water	65
2.2d Water and sediment in river channels	71
2.3 Principles Applied to the Drainage Basin	74
2.3a Particles on slopes	75
2.3b Fluids in channels	77
2.3c Equilibrium concepts	82
2.3d Utilization of models	86
2.4 Patterns of Process	89
2.4a Temporal patterns and sequences	89
2.4b Measuring process rates	92
2.4c Some controls of spatial patterns	98
2.5 Prospects in the Drainage Basin	105

	107
3 Coastal Processes	108
3.1 Waves	108
3.1a Wave propagation velocity	109
3.1b Wave types	111
3.1c Waves generated by the wind	111
3.1d Wave attenuation: shoaling transformation	112
3.1e Wave energy	112
3.1f Breaking waves	114
3.1g Surf beat	114
3.1h Long period waves	114
3.1i Wave refraction	115
3.1j Wave refraction diagrams	119
3.1k Wave reflection	119
3.1l Wave diffraction	119
3.1m Wave direction	120
3.1n Edge waves	122
3.2 Tides and Variations in Mean Sea Level	126
3.3 Nearshore Sediment Budget	127
3.3a Fluvial sediment discharge	128
3.3b Estuaries	130
3.4 Hydrodynamics of the Nearshore Zone	132
3.4a Longshore currents	132
3.4b Rip currents: nearshore cell circulation	134
3.4c Longshore sediment transport	137
3.5 Estimates of Sediment Transport from Tracer Dispersal Studies	139
3.6 Beach Processes and Monitoring Techniques	140
3.6a Beach profiles	143
3.6b Effects of swash percolation and groundwater flow on beach profiles	143
3.6c Beach gradients	145
3.6d Ridge and runnel profiles	147
3.6e Summary comments	148
3.7 Rhythmic Shoreline Features	152
3.8 Textural Parameters of Shoreline Sediments	153
3.8a Changes normal to the shoreline	154
3.8b Changes parallel to the shoreline	155
3.9 Shoreline Configuration: Beaches in Plan	157
3.10 Planning and Coast Protection	157
3.10a Beach nourishment	158
3.10b Coast protection schemes	159
3.10c Dredging offshore banks	160
3.11 Concluding Remarks and Suggestions for Future Research	
4 Aeolian Processes	162
4.1 Entrainment and Transport: Threshold Speed and Grain Size	162

4.1a	Grain size	167
4.2	Abrasion and Deflation	169
4.2a	Surface roughness	169
4.2b	Ventifact formation and deflation	169
4.3	Bedforms	172
4.3a	Sand ripples and ridges	174
4.3b	Seif or longitudinal dunes	176
4.3c	Barchan dunes	179
4.3d	Ergs	184
4.4	Loess	185
4.5	Conclusions and Prospects	185
5	Cryonival and Glacial Processes	187
5.1	Forms of Ice in the Landscape	188
5.1a	Ground and soil ice	189
5.1b	Snow and firn	190
5.1c	Glacier ice	191
5.2	Some Properties of Massive Ice	192
5.3	Cryonival Processes	199
5.3a	Rock disruption	199
5.3b	Soil disruption	204
5.3c	Contraction cracking	221
5.3d	Degradation of permafrost	224
5.3e	Nivation	225
5.3f	Rock glacier flow	226
5.4	Glacial Erosional Processes	228
5.4a	The preparatory processes	228
5.4b	Processes of glacial erosion	229
5.5	Debris Entrainment by Glaciers	243
5.6	Glacial Depositional Processes	247
5.6a	Glacigenic sediments	247
5.6b	Lodgement	251
5.6c	Meltout, flow and sliding	263
5.7	Meltwater Erosion and Glaci-aquatic Sedimentation	267
5.7a	Meltwater erosion	272
5.7b	Glaci-aquatic sedimentation	275
5.8	Post-depositional Processes Affecting Glacial Sediments	280
5.9	Landform and Sediment Associations in Space and Time	281
5.10	Prospects for Cold Climate Process Studies	285
6	Conclusion: A Postscript	286
	Bibliography	290
	Subject Index	306
	Geographical Index	311