

Contents

Preface to the second edition	xi
Acknowledgements	xiii
List of Figures	xv
List of Tables and Panels	xxiii
1 Introduction	01
1.1 Coastal geomorphology	01
1.2 Terminology	02
1.3 Ancient coastlines	03
1.4 Coastline morphology	05
1.5 Coastline length	07
1.6 Coastal evolution	08
1.7 Changing coastlines	09
1.8 Summary	11
2 Coastal processes	13
2.1 Introduction	13
2.2 Waves	13
2.3 Tides	25
2.4 Storm surges	31
2.5 Tsunamis	32
2.6 Currents	34
2.7 Nearshore water circulation	35
2.8 Wind action	36
2.9 Other processes	36
2.10 Modelling coastal processes	36
2.11 Summary	37
3 Land and sea level changes	39
3.1 Introduction	39
3.2 Mean sea level	39
3.3 Causes of sea level change	40

3.4	Measuring changes of level	45
3.5	Correlation and dating of former coastlines	46
3.6	Emerged coastlines	46
3.7	Submerged coastlines	51
3.8	Sea level variations	53
3.9	Late Quaternary sea level changes	53
3.10	Modern sea level changes	58
3.11	Recent changes of land and sea level	62
3.12	Future sea level changes	65
3.13	Summary	66
4	Cliffs	67
4.1	Introduction	67
4.2	Cliff evolution	69
4.3	Cliff morphology	74
4.4	Cliff weathering in cold climates	85
4.5	Cliffs and bluffs on humid tropical coasts	86
4.6	Cliff dissection	87
4.7	Outlines in plan of cliffed coasts	95
4.8	Coastal landslides	98
4.9	Rates of cliff recession	102
4.10	Summary	106
5	Shore platforms	107
5.1	Shore processes	107
5.2	Shore platforms	113
5.3	Plunging cliffs	130
5.4	Summary	132
6	Beaches	133
6.1	Introduction	133
6.2	Beach sediments	134
6.3	Evolution of beaches	137
6.4	Provenance of beach sediments	138
6.5	Weathering of beach material	160
6.6	Beach rock	161
6.7	Nearshore processes	162
6.8	Beach morphology	162
6.9	Beach outlines in plan	164
6.10	Beach outlines in profile	171
6.11	Beach morphodynamics and beach states	179
6.12	Use of models	181
6.13	Beach compartments	182
6.14	Beach budgets	183
6.15	Tracing beach sediment flow	184
6.16	Lateral grading	187
6.17	Prograding beaches	190
6.18	Beach ridges	193

6.19 Cheniers	197
6.20 Beach lobes	198
6.21 Summary	200
7 Beach erosion	201
7.1 Introduction	201
7.2 The multiple causes of beach erosion	217
7.3 Effects of artificial structures on beaches	218
7.4 Beach nourishment	219
7.5 Summary	221
8 Spits, barriers and bars	223
8.1 Introduction	223
8.2 Spits	223
8.3 Tombolos	229
8.4 Cuspate and lobate spits	230
8.5 Cuspate and lobate forelands	234
8.6 Coastal barriers and barrier islands	235
8.7 Intertidal sandflats	242
8.8 Bars and troughs	242
8.9 Sand shoals	245
8.10 Ripples	245
8.11 Sandstone reefs	246
8.12 Summary	246
9 Coastal dunes	247
9.1 Introduction	247
9.2 Foredunes	250
9.3 Backshore cliffing of dunes	252
9.4 Parallel dunes	253
9.5 Blow-outs and parabolic dunes	255
9.6 Transgressive dunes	258
9.7 Cliff-top dunes	261
9.8 Dunes on shingle	261
9.9 Rates of dune movement	262
9.10 Dune calcarenite	263
9.11 Machair	265
9.12 Coastal dunes in the humid tropics	266
9.13 Old and new dunes	267
9.14 Dune sandrock	268
9.15 Dune lakes	268
9.16 Summary	268
10 Intertidal wetlands	271
10.1 Introduction	271
10.2 Intertidal morphology	271
10.3 Sources of intertidal sediments	274
10.4 Mudflats	274

10.5	Intertidal vegetation	276
10.6	Sea-grass beds	276
10.7	Salt marshes	277
10.8	Mangroves	286
10.9	Freshwater swamps	293
10.10	Summary	294
11	Estuaries and lagoons	295
11.1	Introduction	295
11.2	Rias	295
11.3	Fjords	296
11.4	Fiards	298
11.5	Calanques	298
11.6	Sharms and sebkhas	298
11.7	Estuaries	299
11.8	Coastal lagoons	311
11.9	Summary	329
12	Deltas	331
12.1	Introduction	331
12.2	Delta components	331
12.3	Deltaic processes	332
12.4	The Mississippi delta	334
12.5	Delta outlines	337
12.6	Delta evolution	342
12.7	Delta shores	346
12.8	Summary	347
13	Coral and algal reefs	349
13.1	Introduction	349
13.2	Coral reefs	349
13.3	Origin of coral reefs	350
13.4	Rates of growth	351
13.5	Fringing reefs	353
13.6	Barrier reefs	354
13.7	Atolls	357
13.8	Emerged coral reefs	359
13.9	Islands on coral reef platforms	360
13.10	Algal and other biogenic reefs	363
13.11	Summary	364
14	Future coasts	365
14.1	Introduction	365
14.2	Greenhouse effect and sea level rise	365
14.3	General effects of a rising sea level	366
14.4	Effects of a changing climate	369
14.5	Effects on cliffs and shore platforms	369
14.6	Effects on beaches, spits and barriers	372

14.7 Effects on coastal dunes	376
14.8 Effects on intertidal wetlands	376
14.9 Effects on estuaries and lagoons	379
14.10 Effects on deltaic coasts	380
14.11 Effects on coral and algal reefs	381
14.12 Conclusion	385
14.13 Summary	385
References	387
Index	405