

Index

Page numbers in *italics* denote Figures. Page numbers in **bold** denote Tables.

- Al-Qalibah 55
Alexander Hills 36, 37, 43
Algeria, glacial shelf architecture 2
Alwizam 55, 67
 palaeovalley complex 81–103
 breccia 85, **88**, 89, 90–91, 99, 100
 CPDC **88**, 96, 99, 100, 103
 deformation structures 96–98, 99
 dewatering features 96, 97, 98
 HNMs 96–97, 98, 99, 100, 101
 striated pavements 96, 97–98, 99
 facies association
 glacial advance/standstill 99–100, 101
 glacial retreat 100
 glacial evidence 83, **8**
 origin 101–102
 regional context 102–103
 reservoir properties 98
 sandstone
 conglomeritic sandstone **88**, 89
 lenticular **88**, 91–92, 93
 massive **88**, 92–94, 93, 100, 101
 mud clast conglomeritic **88**, 90–91, 92, 100
 parallel-bedded massive **88**, 94, 95, 96, 100
 stacked scoured **88**, 95, 96, 100, 101
 trough cross-bedded **88**, 94, 95, 100, 101
Amargosa aulacogen 47
Amargosa Canyon 36, 47
Ammar Formation 110, 111, 112, 113, 125
anoxia
 Cryogenian 9–10, 25, 27
 Mudawwara Formation 124
Antarctic, trough mouth fans 4, 205, 207
 geometry and dimensions **206**, 212–213
 grain size distribution 213–214
 depletion of fine grains 215–216
 enrichment of coarse grains 214–215
 sediment analysis 208, 210, 211
Antarctic Divergence 184
Antarctic Drilling Program (ANDRILL) 232, 235–236, 237
Antarctic Ice Sheet
 evolution 4, 223–238
 controls on 236–237
 mega-scale glacial lineation 226, 228, 229, 236
 post-LGM deglaciation 227–230
 pre-LGM history 230–237
 seismic data 230–237
 retreat 194
 subglacial features 226–227
 see also East Antarctic Ice Sheet; West Antarctic Ice Sheet
Antarctic Polar Current 184, 195
Antarctic Polar Front 184, 194
Anti-Atlas 163
 deglacial sequence 162–170, 168, 169
 comparison with Québec 170–173
 deltaic wedge 164, 166–167, 168–170
 glaciomarine wedge 164, 165, 166–167
 ice-sheet configuration 165
 post-glacial deposits 166–167, 168, 170
antidunes 94, 96
Arabia, Late Ordovician, glacial margin 3
 see also Saudi Arabia
archaeocyathan limestone, correlation 143–144
Arctic, trough mouth fans 4, 205, 207
 enrichment of fine grains 216–217
 geometry and dimensions **206**, 212–213
 grain size distribution 213–214
 sediment analysis 208, **209**, 210, 211
Aurora Basin 182
autoincision 157, 159
Aztec Siltstone 71

ball and pillow structures 92, 94, 96
Baq'a 55, 57, 58, 68
Baq'a Member 54, 56, 86
basalt, Kingston Peak Formation 46, 47
Basin and Range Province 35, 37
bathymetry, Ross Sea 225, 234, 236, 237
Batra Formation 111, 113
Bay of Harbours Formation 132, 133
Bear Island Fan 205, **206**, 207, **209**
 area 212
 sediment analysis 211, 215
Beck Spring Dolomite 38, 41, 42, 47
Belgica trough mouth fan 204, **206**, 207, **208**
 diamicton grain size 214, 215
 sediment analysis 210, 211
Bellsund Fan 205, **206**, 207
bioturbation
 Risha Formation 116
 Wilkes Land 186, 191–192, 193, 194, 197
Black Mountains 47
Black Rock Member 132, 139, 140, 141–142, 145
Blind Bay, Bourgeois Fjord, subglacial sediments 266
Bluff Cove Formation 132, 133, 134
Bourgeois Fjord, subglacial sediments 266
breccia
 Alwizam palaeovalley 85, **88**, 89, 90–91, 99, 100
 Fitzroy Tillite Formation 136
 Jabal Ahmar tunnel valleys 112, 113
Brenton Loch Formation 132, 133
Buraydah 54, 55, 65

Cape Meredith Complex 132, 133
Cenozoic, glaciated margins 3–4, 181–198
channel levees 181, 183, 184, 194–195
channel networks 228, 229–230, 231, 233, 235
chert, Chuos iron formations 16
Chuos Formation 10, 12
 Cryogenian iron formation 3, 10–29
 geochemistry 18, 19, **20**, 24
 sedimentology 15–16
 sub-ice shelf setting 27–28
 depositional processes 21–23
 diamictite 10, 15, 16–18

- Chuos Formation (*Continued*)
 dolomite 16, 17
 mineralogy 15–16, 23–24, 271
 palaeobathymetry 19, 21
 REEs 15, 18, **20**, 21, 24–25, 26–27, 29
 stratigraphy 11, 13
 sub-ice shelf setting 22–23
 tectonic setting 18–19
 thickness 13, 14, 18–19
 chute-and-pool structures 96
 clast-poor diamictitic claystone unit (CPDC) 83
 Alwizam palaeovalleys **88**, 96, 99, 100, 103
 claystone
 Wilkes Land 191, 193, 194, 195
see also clast-poor diamictitic claystone unit
 climbing dune cross-stratification 94, 96, 165
 clinothems, Sept-Îles deltaic complex 153, 156
 conglomerate, Sperry Wash 38, 40
 continental drift 142
 continental margins
 high-latitude passive 265
 sedimentary processes 181–198
 Corossol structure 246, 251
 Coulman Island 225, 229
 Crary trough mouth fan 204, **206**, 207, **208**
 diamicton grain size 215
 sediment analysis 210
 Cryogenian, glaciated margins 2–3, 272
 Death Valley 35–50
 Crystal Spring Formation 41, 47
 currents
 circumpolar 184
 wind-driven contour 181, 184
 cyclicity, in sedimentation 142
- Damara Belt 10, 11, 13
 iron formations 16
 geochemistry 18
 Damaran Orogeny 10
 Death Valley 37
 Cryogenian glaciated margin 35–50
 converging ice masses 47–48
 diachronous rifting and glaciation 48, 50
 palaeogeographic/ice sheet reconstruction 48
 rift shoulders 46–47
 diamictite 3, 36
 glacial geology 36–46
- debris flows
 Chuos Formation 22, 23
 trough mouth fans 204, 207
 Wilkes Land 194
- debrites
 Alwizam palaeovalley complex 100
 Kingston Peak Formation 38
 Risha Formation 123
 Wilkes Land 194
- décollement surfaces 58, 60, 63, 64, 71
- Deep Sea Drilling Project (DSDP)
 Leg 28, Ross Sea 223, 231, 232
see also International Discovery Program
- deformation
 Qasim Formation 85
 subglacial
 North Africa 63–64
 Zarqa megafacies 60–64, 70–71, 72–73, 74
 deglacial sequences 149–150
 Anti-Atlas 162–170
 Gulf of Maine 162
 Québec North Shore 151–175, 157–159, 162
 sequence stratigraphy 173–174
 deglaciation 227–229, 242–257, 264, 266, 267–268,
 272, 273
 Early Permian
 Falkland Islands 131–145
 correlation 144–145
 modelling 142
 Karoo Basin, correlation 144–145
 Laurentide Ice Sheet 243–244
 post-LGM, Antarctic margin 227–230
 delta-front shoreface, Sept-Îles deltaic complex 153
 deltaic complexes
 Anti-Atlas 162–170
 comparison with Québec 170–173
 deglacial sequence 157–159
 comparison Quaternary/Ordovician 172–173
 glacial surface of erosion 159, 161
 glaciofluvial lobes 157, 159
 glaciofluvial transition surface 159, 161
 glaciomarine depocentres 157
 paraglacial transition surface 159, 161
 stratigraphic surfaces 159, 161
 transgressive ravinement surface 161, 162
 Portneuf 155, 162
 Québec North Shore 151–152
 comparison with Anti-Atlas 170–173
 Sept-Îles 153–157, 154
 deltaic wedge, Anti-Atlas 164, 166–167,
 168–170
 detachment surfaces, Zarqa megafacies 58, 60,
 63, 64, 71
- Devede Formation 13, 14
 dewatering features 90, 96, 97, 98
 Zarqa megafacies 58, 61, 62, 63, 64
- diamictite
 Alexander Hills 43
 ancient and modern 272–273
 Chuos Formation 3, 10, 15, 16–18
 depositional processes 21–22
 Cryogenian 3, 272
 Fitzroy Tillite Formation 134, 136
 Kingston Peak 36, 38, 40, 41–46, 47, 48
 Kingston Range outcrop belt 41, 42
 Late Ordovician 272
 Arabia 3
 Panamint Range 45–46, 47
 Port Sussex Formation 138, 140, 141, 143
 Salt Spring Hills 45–46
 Silurian Hills outcrop belt 43–44, 48, 49
 Sperry Wash 48
 ‘Sturtian’, Flinders Range 3
 Wilkes Land 187, 189, 194, 195
 Zarqa megafacies 65–68, 71
- diamicton
 Ross Sea 231, 232, 233
 trough mouth fans 204, 207, 211
 Arctic/Antarctic differences 214–217
 grain size 213–214
 Zarqa megafacies 70

- diatoms
 ooze, Wilkes Land 195
 productivity, Southern Ocean 185
- distal submarine fan, Wilkes Land 193–194
- Djado Basin, Niger, subglacial deformation 64, 68, 70, 76
- dolomite, Chuos Formation 16, 17
- dolostone
 Saddle Peak Hills 38, 41
 Sperry Wash succession 38, 40
- Drake Passage 195
- dropstones
 Anti-Atlas 165
 Chuos Formation 16, 22, 23, 29
 Ediacaran 265, 271, 272
 Fitzroy Tillite Formation 136
 Hells Kitchen Member 137, 138, 140, 141
 Kingston Range outcrop belt 42, 43
 Salt Spring Hills 45, 48, 50
 Silurian Hills outcrop belt 43, 48
 Sperry Wash succession 38
- drumlinoids, Antarctic continental margin 226–227
- Drygalski Ice Tongue 225, 229
- Drygalski Trough 228–229, 236
- Dubeidib Formation 110, 111, 113, 120
 deposition 121–122
 erosion 114–115, 117, 118, 121–122, 124, 126
 incisions 122, 126
- dunes *see* antidunes; climbing dune cross-stratification
- dust, trough mouth fans, Arctic 216
- Dwyka Group 144, 145, 271
- Dwyka Tillite, correlation with Fitzroy Tillite 133, 142, 143–144
- dykes, dolerite, Falkland Islands 134
- East Antarctic Ice Sheet 182, 223, 224
 LGM 226, 227, 236–238
 post-LGM ice-marginal landforms 228–229
 pre-LGM evolution 230, 234, 235
- East Antarctica, Cenozoic glaciated margins 181–198
- East Falkland 132, 133, 134, 136, 137, 142, 143
- Ediacaran, dropstones 265, 271, 272
- Ellsworth Mountains 145
 diamictite, correlation with Falklands 143, 144
- Ellsworth Mountains Microplate 143
- Eocene, East Antarctica margin 181–198
 mid-shelf environments 186–187, 195
- Eocene-Oligocene unconformity, glaciation, East Antarctica 181, 183, 184
- erosion
 Dubeidib 114–115, 117, 118, 121–122, 124, 126
 subglacial 267–268
- erratics, West Falkland 135, 136, 138, 143–144
- Europium, anomalies 26–27, 29
- Falkland Island Microplate 131, 143
- Falkland Islands
 borehole data 131–133
 Early Permian, deglaciation 131–145
 geology 132, 133–134
 glacial to post-glacial transition 134–142
 regional correlation 143–145
 stratigraphy 133
- falling-stage systems tract (FSST) 173
- Fennoscandian Ice Sheet 270
- fentes en gradins* 65, 83
- Filchner Trough 204
 sediments 214, 215
- Fitzroy Tillite Formation 132, 133, 134, 135, 136, 137, 138, 140, 144, 145
 archaeocyathan limestone 143
 breccia 136
 correlation with Dwyka tillite 133, 142, 143
 glacitectonic structures 136
 flame structures 92, 94, 95, 138
- fluvial sediment, Arctic trough mouth fans 216–217
- folding, Zarqa megafacies 57, 58, 59, 60, 61, 62
- foliation, glacio-tectonic 60, 61, 62, 64
- Fox Bay Formation 132, 133
- Fransfontein Ridge 10, 11, 12
- Franz Victoria Fan 205, 206, 207
- Gariep Belt 10
- Garlock Fault 36, 37
- Geological Society of London
 Atlas of Submarine Glacial Landforms 2
 Special Publications on glaciated margins 1–2
- Ghaub Formation 11, 12
- Gilbert-type delta 154, 155, 156, 157, 159, 161
- glacial retreat system tract (GRST) 174
- glacial surface of erosion 159, 161, 164, 166–167, 174
- glacial unconformities, Antarctica 224, 225, 226, 232, 233
- glaciated margins
 ancient and modern 4, 261–274
 Cenozoic, East Antarctica 181–198
- glaciation
 ancient 265, 270–274
 and diachronous rifting 48–50
 and iron formations 27–28
 Late Ordovician 110–111
 NE Jordan 119–121
 LGM 263, 267–270
 modern 263, 265–267, 272–274
 Quaternary 261, 263, 267–270, 273–274
 sea-level change, and stratigraphy 71, 74–76
- glaciers, extent
 LGM 261, 262
 modern 261, 262
- glacigenic debris flows (GDFs) 204, 207, 216–217
- glacimarine systems 263–265
 ancient 265, 270–274
 modern 263, 265–267, 272–274
 Quaternary 267–270, 273–274
- glacio-eustatic sea-level rise 150, 151, 152
- glacio-isostatic adjustment 149–150, 152, 153, 157, 159, 172–173, 174, 243–244, 261, 265
 and relative sea-level 149, 150, 151, 152, 157, 158, 159, 161, 172–173, 174
- glaciofluvial sediments, Sept-Îles deltaic complex 153, 157, 158, 159
- glaciofluvial transition surface (GTS) 159, 161, 166–167, 173, 174
- glaciomarine wedge
 Anti-Atlas 164, 165, 166–167, 168
 Sept-Îles deltaic complex 153, 157, 158
- glacitectonite
 Kingston Peak Formation 38, 40
 Zarqa megafacies 60, 61, 62, 70

- Glossoptera* 133
 Goldthwait Sea 150, 152, 243
 Goler Wash succession 45, 47
 Gondwana
 climate change 131
 glaciation 53, 54, 57, 61, 70, 71, 74, 82, 109
 reconstruction 71, 82, 142–143
 Silurian shale 113
 see also Mudawwara Formation
 granite, Zarqa megafacies 65, 66, 68
 grounding line advance, Antarctic Ice Sheet 237
 grounding line fans 151, 174
 Sept-Îles deltaic complex 153
 grounding line retreat, Ross Sea 229–230, 236
 grounding-zone wedges 75, 151, 159, 241, 268
 Antarctica 227, 228–229, 233, 234, 236, 238
 Anti-Atlas 165, 168
 Laurentide Ice Sheet margin 4, 241–257
 Sept-Îles deltaic complex 153, 157
 Gulf of Maine, deglacial sequence 162
 Gulf of St Lawrence
 glaciated margin 4, 150, 151, 242–243, 256
 deglaciation 243, 256
- Hanadir Member 56, 69, 86
 Hawban Member 54, 56, 68–70
 Hells Kitchen Member 132, 133, 137,
 138–141, 145
 correlation with Karoo Basin 144
 deposition modelling 142
 hematite, Chuos Formation 15–16, 17, 24
 hemipelagic sediments
 Arctic trough mouth fans 216
 Wilkes Land 194–195
- Hirnantian glaciation
 Jordan 109
 post-glacial transgression 113
 Saudi Arabia 53, 57, 68, 70, 71, 74, 75, 76, 82
 palaeovalleys 83
- Hiswa shales 110, 111
 hydroplastic normal microfaults (HNMs) 83, 85, 94,
 96–97, 98, 99, 100, 101
 hydrothermal processes, and NIF formation 25–27
 hyperpynal flow 195, 197
- ice streams 203, 206, 267
 Antarctic trough mouth fans 4, 215
 Paleozoic 271, 272
 retreat 229, 236, 237–238
- ice-bed coupling 63, 76
 ice-contact fan 159, 174
 Laurentide Ice Sheet 247, 253, 255, 256
 Sept-Îles deltaic complex 157
- ice-distal marine setting 263
 ice-marginal marine setting 263
 ice-proximal fan
 Chuos Formation 22
 Risha Formation 122–123, 124
- ice-rafted debris (IRD)
 Anti-Atlas 165, 169
 Chuos Formation 22–23
 Hells Kitchen Member 138–139, 140, 141
 NE Jordan 120, 126
 Sept-Îles deltaic complex 157
 trough mouth fans 207, 216
 Wilkes Land 193, 194, 195, 197, 198
- icebergs
 East Antarctica 184
 Pine Island Bay 267
 plough marks 68, 207, 247, 264, 267, 268
 source of IRDs 22–23, 263
- Integrated Ocean Drilling Program (IODP) drill holes
 East Antarctica 182, 183
 middle Eocene inner shelf 187–189
 Ross Sea 223
 Site U1356 182, 183, 184
 Ba and Si excess 185–186
 Early Eocene mid-shelf environment 186–187
 Miocene deep water environments 194–195
 Oligocene deep water environments 193–194
 particle size distribution 184–186, 187, 194
 sequence stratigraphy 186–189
 Site U1360 182
 Oligocene glacially influenced shelf 189–193
 sequence stratigraphy 189–193
- International Discovery Program 268
 iron formations, Neoproterozoic
 Chuos Formation 3, 9–29
 depositional processes 22
 genesis 10
 hydrothermal origin 25–27
 and Snowball Earth hypothesis 3, 9–10, 27
- Isfjorden Fan 205, 206, 207, 209, 215
 isostasy 71, 75
- Jabal Ahmar tunnel valley 111, 113, 123
 infill 111–112, 125
- Jal as Saqqiyah 55
 boulder-bearing diamictite 65, 66, 67, 68
- Jal az Zarqa 55, 58
 Jbel Bani 164
 JOIDES Trough 225, 229, 236
- Jordan
 depositional model 109–127
 glacial evidence 119–121
 glacial shelf architecture 2, 3
 post-glacial transgression 113, 125
 tunnel valleys 109, 110, 111–113, 122, 125, 126
- Kahfah Member 56, 69, 86, 111
 Kaoko Belt 10, 11
 Karibib Formation 11, 12, 13
 Karoo Basin, correlation with Falkland Islands
 143, 144
- kettles 247
 Kingston Peak Formation
 Cryogenian glaciated margin 3, 35, 36, 37, 38
 diachronous rifting and glaciation 48, 50
 faults 38, 49
 sedimentary logs 39
- Kingston Range 36, 37, 41–43
 diachronous rifting and glaciation 48, 49
 ice sheet reconstruction 48
 see also Southern Kingston Range
- Kingston Range Fan 43
 Kongsfjorden Fan 205, 206, 207, 209, 210
 Ktaoua Group 162, 164, 165
 Kuisëb Formation 11, 12, 13

- Kunene region, Namibia 10
 Kveithola Fan **206**, 207, **210**
- Lafonia Group 132, 133, 134, 136, 141–142
 Lake Daigle Moraine 153, 154, 155, 156, 243
 Lake Walker 245, 247
 laminite, Sperry Wash 38, 40
 Landeck farm 10, 12
 iron formations 16
 stratigraphy 13
 landforms 227–229, 242–257, 264, 266, 267–268, 272, 273
 ice-marginal Ross Sea 227–229
 submarine 267
 see also deglaciation
 Last Glacial Maximum (LGM) 152, 161
 Antarctic Ice Sheet 224, 225–227, 236
 palaeodrainage 226, 227, 229, 230, 237
 post-LGM deglaciation 227–230
 pre-LGM history 230–237
 deglaciation 264
 glacier extent 261, 262
 glacimarine system 263–264, 267–270
 Laurentide Ice Sheet 243
 Laurentian Channel 151, 242, 243
 Laurentian Fan 243
 Laurentide Ice Sheet 150, 151, 152, 242
 grounding-zone wedges (GZWs) 241–257
 Last Glacial Maximum (LGM) 243
 moraines 243, 253, 254, 256
 retreat 152, 256
 subaqueous ice-contact fans 253, 255, 256
 submarine glacial landforms 241–257
 swath bathymetry 241–242, 244–247, 248–252, 256
 layering, subglacial shear zones 61, 62
 levees, deep sea, Wilkes Land 181, 183, 184, 194–195
 Libya, glacial shelf architecture 2
 Limekiln Spring Member 45
 liquefaction 62, 63, 68, 76, 94, 96
 load balls 61, 62
 lodgement boulders 68
 lonestones
 Chuos Formation 16, 22
 Kingston Range outcrop belt 42, 43
 Saddle Peak Hills 41
 Salt Spring Hills 44–45, 48
 Sept-Îles deltaic complex 157
 Silurian Hills outcrop belt 44
 Sperry Wash succession 38
 Lowenfontein farm 10, 12, 13
 iron formation/diamictite contact 17
 Lower Second Bani Formation 162, 164, 165, 166–167
- McMurdo Sound, glacio-marine sediments 2, 225, 235
 magmatism, syn-glacial, Death Valley 48, 50
 magnetite, Chuos Formation 15–16, 17, 24
 Marinoan glaciation 35
 sedimentation 35, 36
 maximum retreat surface (MRS) 173
 mega-scale glacial lineations (MSGSLs) 267, 268, 272
 Antarctic Ice Sheet 226, 228, 229, 236
 Québec North Shore 256
 meltwater plume deposition
 Anti-Atlas 169
 Sept-Îles deltaic complex 157
 trough mouth fans 122–123, 204, 207, 215–216
 meltwater systems 3, 263
 subglacial 2, 22, 81, 99, 102, 236
 metabasite
 Panamint Range 46, 47
 Silurian Hills 48
 metabentonite 133, 138, 142
 Metschel Tillite 71
 micro-faults *see* step-fractures
 Mingan Archipelago, ice-contact fan 253, 255, 256
 Miocene
 Ross Sea, AIS evolution 232–234, 235, 236
 Wilkes Land
 deep water depositional environment 194–195
 hemipelagic sedimentation 192, 195
 Mitten Fold 10, 12
 stratigraphy 13
 Moisie River 153, 154, 246, 250, 252
 Mojave Uplands 36, 44, 47
 moraine
 end, tide water glaciers 2
 Lake Daigle 153, 154, 155, 156
 Laurentide Ice Sheet 243, 253, 254, 256
 recessional 236
 Ross Sea 227–228, 229
 MORB-type basalt, Kingston Peak Formation 46, 47
 Mudawwara Formation 111, 113, 115, 116, 123–124, 126
- mudstone
 Black Rock Member 140, 141, 144
 Port Sussex Formation 138
 Sperry Wash 38, 40
 Wilkes Land 189, 191
- Naauppoort Formation 10, 11, 12
 Namibia, Cryogenian glaciation 3, 10–29
 nannofossil ooze 194, 197
 Naust sequence, landforms 268, 269
 Neoproterozoic
 Death Valley 35–50
 iron formations (NIFs) 3, 9–29
 and glaciation 27–28
 hydrothermal origin 25–27
 Noonday Dolomite 38, 42
 Nopah Uplands 36, 37, 43, 47
 North Sea, tunnel valley systems 2
 North Sea Fan **206**, **209–210**
 area 212
 Northern Basin, Ross Sea 225, 235, 237
- Okatjize Formation 11, 12, 13
 Okavare 10, 13
 diamictite 17, 18
 iron formations 16
 Okonguarri Formation 11, 12
 Oligocene, Wilkes Land 181, 182, 189–193
 Oligocene-Miocene
 Antarctic Ice Sheet evolution 231–232, 236
 Wilkes Land 193–195, 197
 olistotromes 3
 Kingston Range outcrop belt 41, 42, 48
 Silurian Hills 48
 orbital geometry, and sediment deposition 142

- Ordovician, Late
 deglacial sequence 162
 comparison with Quaternary 171, 172–173
 glacial record
 comparison with Quaternary, sediments 272
 Saudi Arabia 3, 53–77
 stratigraphy 56
 glaciation 110–111, 163
 Jordan, depositional model 109–127
 palaeovalley complex 81–103
- Orusewa Formation 11, 12, 13
 iron formations 16
- Otavi Fold Belt 10, 11, 13, 14
 iron formations 16
 geochemistry 18
- Otavi Group 10
- outwash fans 149
 Risha Formation 122–123, 124, 126
- Pakhuis Formation, subglacial deformation 76
- palaeocurrents, Kingston Peak Formation 38, 48
- palaeodrainage
 Antarctic Ice Sheet 237
 Saharan Ice Sheet 271, 272
- palaeovalleys
 Jordan 111
 Ordovician 271
 Saudi Arabia 3, 54, 81–103, 84, 88
 origin 101–102
see also tunnel valley networks
- Paleozoic
 glaciated margins 3, 271
 Late Paleozoic Ice Age 272
- Panamint Range 36, 37
 ice masses 47
 pillow lava 47, 50
 sedimentation 45–46, 47, 49
- paraglacial sediments, Sept-Îles deltaic complex 153, 158, 159
- paraglacial transition surface (PTS) 159, 161, 173, 174
- Pennell Trough 225, 229, 236
- Pentecôte River 245, 247, 248
- Permian, Early, deglaciation, Falkland Islands 131–145
- Piedra Azul Formation, Falkland Island correlation 144
- pillow lava, MORB-type, Panamint Range 47, 50
- Pine Island Bay, iceberg calving 267
- Pine Island Glacier 265
- Plio-Pleistocene, Ross Sea, Antarctic Ice Sheet evolution 234–237
- ploughing clasts 68
see also icebergs, plough marks
- pore water pressure 63, 64, 68
- Port Philomel Formation 132, 133
- Port Stanley Formation 132, 133
- Port Stephens Formation 132, 133
- Port Sussex Formation 132, 133, 138–142
- Portneuf deltaic complex 155, 162
- Prince Albert Formation 143, 144, 145
- proximal fan, Wilkes Land 194
- Prydz Channel trough mouth fan 204, 206, 207, 209
 diamicton grain size 214
 sediment analysis 210
- Qa' Hawban 55, 68, 70
- Qalibah Formation 54, 56, 86
- Qasim Formation 54, 56, 59, 69, 70, 71, 72–73, 86, 89, 111
 contact with Sarah Formation 83, 87, 90
 palaeovalleys 82, 83
 deformation 85, 87, 88, 90, 99
- Quark Pond Member 136, 137, 143, 144
- Quaternary
 deglacial sequence
 comparison with Ordovician 171, 172–173
 glacial system 263, 265, 267–270
- Quaternary ice streams 203
- Québec North Shore 150, 242
 deglacial sequences 150, 151–175, 244–256
 comparison with Anti-Atlas 170–173
 deltaic complexes 151–152
 geological and deglacial setting 151–153
 glacio-isostatic sea-level change 152
 grounding-zone wedges 242, 244–253, 256
 mega-scale glacial lineations (MSGs) 256
 moraine 243, 253, 254, 256
- Québec-Labrador Ice Sector (QLIS) 243
- Qusaiba Formation 111
- Qusaiba-1 shallow core hole 70
- Quwarah Member 56, 59–60, 69, 70, 71, 72–73, 83, 86, 111
- Ra'an Member 56, 69, 83, 86, 111
- Rapitan NIF 23, 25, 27, 28
- rare earth elements 15, 18, 20, 21, 24–25, 26–27, 29
- Rasthof Formation 13, 14
- Rawd al-Jiwa 55
- relative sea-level (RSL) 149, 150, 151, 152, 152, 157, 158, 159, 161, 172–173, 174
 Québec North Shore 243, 244
- rhytmite, Hells Kitchen Member 140, 141
- rifting
 diachronous glaciation, Death Valley 48–50
 glaciogenic sediment flux 35, 46–47
 hydrothermal processes 25
- rip-up clasts 90–91, 93, 165, 168, 170, 194
- ripples
 Anti-Atlas 165, 167, 168, 169, 170
 Wilkes Land 189, 193, 194, 195
- Risha Formation 109, 110, 111, 113–127, 126
 deposition 119, 121–124
 facies 116–119
 Risha I Unit 116, 118–119
 Risha II Unit 116, 118
 Risha III Unit 116–118, 125
 glacial evidence 119–121, 126
 isopach 115, 119
 outwash fans 122–123, 124, 126
 reservoir potential 124–125, 127
 turbidity flows 118–119, 122, 123
- Risha gas field 109, 110, 113, 125
 biostratigraphy 113–114
 Risha Formation reservoir potential 124–125, 127
 well data 113–115, 116, 119, 120, 121, 122, 125, 127
- Rodinia, rifting 3, 25, 48
- Rondehoek Fold 10, 12

- Ross Sea
 Antarctic Ice Sheet evolution 230–238
 bathymetry 225, 225, 234, 236, 237
 deglaciated continental shelf 223
 subglacial landforms 2, 226
 ice-marginal landforms 227–229, 231
 Ross Sea Embayment 223, 224
- Saddle Peak Hills succession 36, 37, 38
 sedimentation 39, 41
- Saharan Ice Sheet, palaeodrainage 271, 272
- St Anna Fan 205, 206, 207, 215
- St Lawrence Platform 247, 251
- St Narcisse moraine 243
- Ste Marguerite River 245, 248
- Salt Spring Hills, sedimentation 44–45, 48, 50
- sandstone
 Alwizam palaeovalley complex
 conglomeritic 88, 89
 lenticular 88, 91–92, 93
 massive 88, 92–94, 100, 101
 mud clast conglomeritic 88, 90–91, 92, 100
 parallel-bedded massive 88, 94, 95, 96, 100
 reservoir properties 98
 stacked scoured 88, 95, 96, 100, 101
 trough cross-bedded 88, 94, 95, 100, 101
 Anti-Atlas 165, 166–167, 168, 169, 170
 Kingston Peak Formation 38, 40, 41, 42
 Qasim Formation 85, 88
 Zarqa megafacies 54, 57–65
- Saq Sandstone 54, 82
- Sarah Formation 53, 56, 70, 71, 84
 contact with Qasim Formation 83, 87, 90
 dating 83
 Hawban Member 54, 56, 68–70
 lenticular sandstone 88, 91–92
 nomenclature 54, 70, 82–83
 palaeovalleys 82, 83, 102
 stratigraphy 54, 86, insert
 unconformities 54, 56, 83, 86
- Sarah Ridge 82
- Sarah Sandstone megafacies 54, 56, 58, 67, 70, 82, 86
- Sauce Grande Formation 145
 correlation with Falkland Islands 144
- Saudi Arabia 55
 Late Ordovician glaciation 53–77, 83
 diamictite 3
 palaeovalley complex 81–103, 84
 stratigraphy 56
 Zarqa megafacies 53–77
- Scoresby Sund Fan 205, 206, 207, 210, 215
 sea-level change, glacio-isostatic 150, 152, 153, 157, 159,
 172–173, 174, 243–244, 261, 265
 LGM 261, 269–270
 relative 149, 151, 152, 157, 158, 159, 161, 172–174
 and sequence stratigraphy 71, 74–76, 99
- Second Bani Group *see* Lower Second Bani Formation;
 Upper Second Bani Formation
- sedimentation
 passive continental margin
 Wilkes Land 181–198
 controls on changes 195–197
 rift-related, Death Valley 35
 sub-ice shelf setting, Chuos Formation 21–23
- Sept-Îles Archipelago
 deglaciation 243
 GZWs 251
 mega-scale glacial lineations 246, 256
- Sept-Îles deltaic complex 150, 153–157, 154, 155
 deglacial sequence 157, 158, 159, 160
 depositional facies 153, 156–157, 156
 shale
 Anti-Atlas 170
 Mudawwara Formation 113, 116, 126
- shear, subglacial 61–63, 70
- sheath folds 61, 62, 64
- Shepherds Brook Member 142
- shoaling 189, 195
- siltstone
 Anti-Atlas 165, 169
 bioturbated, Wilkes Land 186
 Chuos Formation 16
 Kingston Peak Formation 41, 42
 Zarqa megafacies 57–65
- Silurian, post-glacial shale
 Anti-Atlas 170
 Jordan 113
- Silurian Hills outcrop belt 36, 37
 ice sheet reconstruction 48
 sedimentation 39, 43–44, 49
- Snowball Earth hypothesis 3, 9–10, 27, 35
- Southern Kingston Range, sedimentation 37,
 39, 48
- Sperry Wash succession 36, 37, 38
 ice sheet reconstruction 48
 sedimentation 39, 40
- step-fractures 63, 65, 67, 68
- Storfjorden Fan 206, 207, 210
- striated pavements 96, 97–98, 99, 149
- Sturtian glaciation 35
 and NIFs 3, 9–10, 27–28
- sub-ice shelf setting, Chuos Formation 22–23,
 27–28
- subglacial features, Antarctic Ice Sheet 226–227
- subglacial marine setting 263
 modern 265–267
- supra-olistotromes, Kingston Range outcrop belt
 41, 42, 43
- Surprise Member 45, 46, 50
- Swakop Group 10
- Tabuk 54, 55
 palaeovalleys 3, 83–103
- Tagounite Trough 162, 163, 164
- Tamadjert Formation 75–76
- Tasman Gateway 181–182, 194
- Tayyarat Formation 54
- till
 Ross Sea 225–226
 subglacial traction 62, 85
- till-matrix framework 63
- tillite, subglacial 68, 75, 76, 100
see also Fitzroy Tillite Formation
- Tindouf Basin 162, 163
- Transantarctic Mountains 182, 229, 236
 uplift 189
- transgressive ravinement surface (TRS) 161, 162, 164,
 166–167, 170, 172, 174

- transgressive systems tract (TST) 173, 174
 trough mouth fans (TMFs) 2, 264
 Antarctic/Arctic 4, 203–217
 bottom current erosion 215
 differences in diamicton grain size
 214–217
 geometry and dimensions **206**, 212–213
 grain size distribution 213–214
 meltwater 215–216
 sediment analysis **208–210**, 210, *211*
 composition 204
 Cryogenian 3
 formation 206–207
- Tubeiliyat Formation 110, *111*, *112*
- tunnel valley networks 2, 102
 Jordan 109, *110*, 111–113, 122, 125, 126
 Ordovician, North Africa *271*, *272*
 see also palaeovalleys
- turbidites
 Alwizam palaeovalley complex 91, 100
 East Antarctica 184
 Kingston Peak Formation 38
 Kingston Range outcrop belt 41, 42, 48
 Risha Formation 118–119, 122, 123
- Upper Second Bani Formation 162, 164, *166–167*,
 170
- upwelling, Southern Ocean 185
- Uqlah Formation 54, 56, 58
- Urucum Iron Formation 25
- Uyun al-Jiwa 55
 boulder-bearing diamictite 65, 66
- Ventania diamictite 143, 144, 145
- Vilkitsky-Khatanga Fan *205*, **206**, 207, **210**
- Voronin Fan *205*, **206**, 207
- Wadi Uqlah 54, 55, 58, *61*
 Zarqa megafacies 65, 67
- Wajid Sandstone 2
- Well A, Saudi Arabia 54, 55, 70, 71, 72–73
- West Antarctic Ice Sheet 223, *224*
 ice-marginal landforms 228–229
 LGM 226, 227, 236–238
 post-LGM deglaciation 227–230
 pre-LGM history 230–236
- West Falkland *132*, 133, 134, *135*, 136, *137*,
 142, 143
- West Falkland Group *132*, 133
- Whiteout Conglomerate 143–144, 145
- Wildrose Diamictite 45
- Wilkes Basin 182
- Wilkes Land
 Cenozoic glaciated margins 3–4, 181–198
 Early Eocene mid-shelf environment 186–187
 geochemistry 185
 Ba and Si excess 185–186
 middle Eocene environment 187–189
 Miocene deep water environment 194–195
 Miocene hemipelagic sedimentation *192*, 195
 Oligocene glacially influenced shelf 189–193
 sequence stratigraphy 184
 stratigraphy 186, 187, *188*, *190*, 191–193
 controls on sedimentation change 195–197
 wind, contour currents 181
- World Beater dome, ice mass 47
- Zarqa Formation 82
 stratigraphy 54
 unconformities 54, 56
- Zarqa megafacies 53–77, 82
 boulder-bearing diamictite 65–68
 characteristics and origin 57–68
 fine-grained sandstone/siltstone 57–65, 68
 deformation 60–64, 72–73, 74
 permeability 63, 64
 folding 57, 58, 59, 60, *61*, 62
 sequence stratigraphic significance 71, 74–76
 subglacial deformation 60–64, 70–71, 72–73, 74
 dewatering features 58, *61*, 62, 63, *64*
 subsurface expression 70–71
 Zoophycos, Wilkes Land 186