

Index

Note: Page numbers in *italic* type refer to illustrations, those in **bold** type refer to tables.

- Abyssochrysos* 280
- accommodation zone 56
- accretionary prisms 220, 235
- actinolite 89, 90, 135, 146, 147
- Adria 220
- advection 99, 139
- Aegir Rift 77
- Afro-Arabia 63
- airgun arrays 21
- Al/Ti ratios 208, 210
- albitization 58, 93, 160, 195
- alteration
 - low temperature 115, 159, 171, 172
 - polyphase 145, 172
- alteration front 132
- alteration haloes 115
- alteration modes 108
- alteration petrography 108
- alteration pipes 155
- alteration stages
 - Juan de Fuca Ridge **114**, 115, 116, 118
 - Troodos ophiolite 142
- alteration zones
 - oceanic crust 82
 - Pitharokhoma pipe 160
 - Troodos 129
- Alvinella pompejana* 260, 264, 265, 266
- Alvinellidae 263, 275
- Alvinocaris* 277
- AMAR programme 1, 14
- amphibole, vein 90, 94
- amphibolite facies 83
- amygdales 141
- analcite 87, 88
- Anarhynchia gabbi* 260
- Andaman Sea 62
- andesites 160
- anhydrite
 - Bent Hill 186, 187
 - in greenschist facies 92
 - ODP Hole 504B 92
 - replacement of 93
 - spires 251
 - Sr in 90, 94
 - TAG mound 203, 211
- anisotropy, gabbro 75
- Annelida 275
- anoxia 272, 284–285
- Antalya Complex 233, 237
- antigorite 75
- antiquity hypothesis 272, 274, 275, 277
- Arabian platform 53
- aragonite 86
- arc basins 219
- archaeogastropods 263
- Archinome* 276
- Argolis Peninsula 233, 236
- Aroania 222, 223, 224
- As 195, 196
- As/Fe ratios 203
- asthenosphere, upwelling 63
- atacamite 203, 205, 209, 210, 213
- Atlantis II Deep 212
- Atlantis II Fracture Zone 31
 - bathymetry 73
 - seismic velocity model 74
 - transverse ridge 76
- axial calderas 17
- axial depth 17
- axial magma chamber 17
 - models 22
- axial valley
 - Gorda Ridge 189
 - Mid-Atlantic Ridge 29
 - segment OH1 5
 - segment OH3 8
- Azema 260
- Azores Triple Junction 1
- back-arc basins 219
- bacterial cells 255, 264
- Baer-Bassit units 233
- barite 191, 242, 245, 246, 248, 252
- Barlo 260, 265
- barnacles 272, 277, 278
 - phylogeny 277
- basal reflector, absence of 18
- basalt
 - alteration 88, 209, 212
 - clastic 209
 - and fluid fluxes 212
 - glassy 10
 - massive flows 106, 184
 - MgO content 17, 31, 58
 - picritic 25
 - within-plate 233
 - see also MORB
- basaltic glass 141
- basement, burial of 120, 122
- basement fluids, Sr ratios 85
- basement temperatures, Middle valley 178
- basement-sediment interface, temperatures 103, 106, 122
- bathymetric maps, MAR segments 3
- bathymetric sections, segments OH1 and OH3 7
- Bathymodiolus* 267, 281

- Bathypecten* 282
 Bayda 260
 Benioff zone 62
 Bent Hill massive sulphide 177, 178, 188
 lithostratigraphy 179, 180
 rock types 182–183
 Besshi-type deposits 186
 Bi 195, 196, 257
 tellurides 247
 bivalves 262, 263
 Bivalvia, endemicity 274, 281–282
 black smokers
 Archaean 241
 EPR 20
 fluid analysis 203
 fluxes 129
 and ochres 218
 REE composition 153, 154, 169
 Sr ratios 86, 87, 93, 94, 136, 148
 temperatures 90
 Blanco Fracture Zone 189
 block faulting 100, 106
 block rotation 54
 boudinage 46, 54
 Bouguer anomalies, *see* mantle Bouguer anomalies
 boundary layer, temperatures 148
 brachiopods 243, 260, 263, 264, 267
 breccias
 hyaloclastite 86
 ODP Hole 896A 82
 ODP Leg 168, 106, 107
 Sr ratios 85
 striated 6
 sulphide 180, 242
 brittle structures 54
 Brunhes Epoch 178
 Buribuy 262
 Buried Basement transect 100, 103–106
- Caenogastropoda 280
 calcite, secondary mineral 86, 209
 calcite compensation depth 265
 calderas, axial 17
Calypptogena 263, 281, 284
Candelabrum 282
 carbon dioxide, and mass extinction 284
 carbonate
 accumulation 284
 authigenic 190
 biogenic 203
 dissolution rates 265
 secondary minerals 88, 110, 116, 121
 Carrick Luz shear zone 33–39
 principal features 35
 Cascadian Basin 103
 cataclasite 36
 celadonite
 in alteration assemblages 85, 110
 formation temperature 120
 in oxidation haloes 115, 116
 Troodos 142
 Central Hill 189
 lithostratigraphy 189, 190
 location map 190
 rock types 192
 sulphide deposits 191
 chalcophile elements 203, 208, 210, 213
 chalcopyrite
 Bent Hill 181, 185
 conduit lining 251, 257
 disease 247
 in umbers 52
 Urals 242, 245, 246, 247
 characteristics, MAR segments 4
 chert breccias 223
 cherts, Mn-rich, *see* Mn-chert
 chimney spires
 black smokers 241
 fluid chemistry 255
 fluid inclusions 243, 250, 257
 fragments 246, 247, 251
 isotope chemistry 249–240
 mineral chemistry 248–249
 mineralogy 245–248
 sampling 243
 zonation 245–248, 249, 255, 256, 257
 chimney walls 251, 254
 chlorite 92, 93, 115, 119, 146
 formation temperature 169
 chlorite/smectite 110, 115, 119, 143, 160, 163–169, 171
Chorocaris 277
 Cl concentration, pore fluids 193
 Claire Seamount 8
 clay minerals
 alteration products 209
 Sr ratios 86
 Cleft segment 31
 clinopyroxene, recrystallization 89, 90
 Clipperton 20
 Co, enrichment 232
 colloform banding 185, 227, 229
 colonisation, vent sites 283
 compaction length 25
 complexation 153, 211
 compositional layering 46
 concentration-depth profiles 194
 cones, pillowed 5
 continent-ocean transition 77
 copepods 276
 copper, *see* Cu
 Costa Rica Rift
 black smokers 91
 location map 82
 Coverack 33, 39
 cowlesite 165, 170
 crack closure, depth relations 77
 cross-cutting relations
 dyke-serpentinite 78
 Kizildag 48
 Troodos ophiolite 136, 141
 crust, lower 44
 Crustacea, endemicity 274, 276–279
 crustaceans, Carboniferous 267
 crustal age/distance from ridge 101
 crustal ageing 155, 171
 crustal denudation 53
 crustal evolution 83

- crustal temperature, and alteration 122
 crustal thickness
 histograms 72
 Lucky Strike segment 5
 Na values 72
 crusts, Mn-rich 217, 218
 crystal content/depth relations 25, 26
 crystals, gravity settling 26
 Cu
 in massive sulphides 186, 188
 supergene enrichment 209, 210, 236
 Cu-Fe sulphides 181, 191
 cumulates
 Kizildag 46
 Lizard ophiolite 33
 in lower crust 17
 Oman 25
 Troodos ophiolite 154

 decapods 276, 277
 Deep Copper Zone 181
 deformation, polyphase 45
 Dellwood Seamount 219
 detachment faults 56, 75
 detachment surfaces 56
 diabase
 Troodos 133
 volume loss 129
 diagenetic enrichment 219, 230
 diapirization 56, 63
 diffusive exchange 120, 139, 142
Dirivultus dentaneus 276
 discontinuities, non-transform 2, 5
 dolerite
 Juan de Fuca Ridge 106, 107
 Kizildag 46
 dolomite 185
 down-core variation, metal ions 206
 Drimos 222, 224
 ductile flow 35
 ductile shear 33, 35, 53
 dunite 33, 46
 Dy/Yb ratios, Kizildag 58
 dyke injection
 and fissuring 17
 Iceland 31
 Kizildag 47, 49, 50
 lateral 12
 dyke/gabbro contacts, Kizildag 47, 49
 dykes
 alteration minerals 143
 diabasic 49, 83
 gabbroic 35
 multiple generations 49
 Pitharokhoma 163, 170
 vertical orientation 39
 see also sheeted dykes

 earthquakes 52
 East Pacific Rise
 bathymetry 18
 cross-section 47
 hydrothermal signature 91
 magma chamber 52
 rare-earth elements 212
 seamounts 219
 segments 19
 seismic structure 26
 study area 19
 Eastern Manus Basin 219
Ecbathyrion prolificauda 276
 effluent temperature 127
 ejecta deposits 6
 electron microprobe analyses, see microprobe analyses
 elongation factor 275
 emplacement modes, Juan de Fuca Ridge 106
 Endeavour segment 100
 endemism 272, 273, 274, 282
 see also specific groups
Eochionelasmus 277, 278
 epidosite 129, 130, 133
 epidote 90, 91, 93, 94, 147
 eruption volumes 26
 Escanaba Trough 177, 189, 267
 Euomphalina, evolution 278, 280
Euphrosine rosacea 276
 Explorer plate 177
 extensional faults, continental 38
 extensional tectonics, Kizildag 53–54
 extrusive forms 12, 40

 FAMOUS segment 1
 geological interpretation 13
 source 14
 TOBI images 12
 FARA-InterRidge programme 1
 fault displacement, Carrick Luz 39
 fault geometry 44
 fault gouge 36, 136
 fault orientation, Kizildag 53
 fault scarps
 segment OH1 5, 6
 segment OH3 10
 fault surfaces, corrugated 31
 fault zones, serpentinitisation at 78
 faults
 accommodation by 31, 40
 depth of rupture 52
 dyke-parallel 53, 54
 fluid channelling 135
 fluid down-welling 136
 fluid up-welling 138
 Kizildag 47, 51
 as melt conduits 32, 39, 40
 Mid-Atlantic Ridge 44
 mineralized 50
 seismogenic 76
 see also specific fault types
 faunal origins, vent communities 282
 faunas
 deep ocean 271
 vent-associated 241, 243, 271
 FAZAR cruise 2
 feldspar alteration 90
 ferromanganoan sediments 155
 Figueroa 260
 fissure swarms 5
 fissures, density 17

- Flascarpia alvinae* 276
 fluid channelling
 faults 135
 flow and pillow margins 141
 fluid flow
 buoyancy-driven 106
 within-mound 203
 fluid fluxes
 and basalt alteration 212
 hydrothermal systems 90, 127
 ridge flanks 99
 ridge/flank transition 103
 Troodos ophiolite 131, 145
 variables **132**
 fluid inclusion studies 87, 243, 245, 250, **252**
 fluid-rock interactions 81, 99
 kinetic controls 139
 temperatures 83
 fluids, *see also* hydrothermal fluids
 foliation planes 54, 75
 fore-arc environment, Kizildag 62
 formation temperatures, vein carbonates 88
 fossil tubes 260, 265, 266
 fossilization, at vent sites 264–266
 fossils 259
 identification problems 266–267
 Sibay 262, 263
 Yaman Kasy 263, 264, 265
 fractional crystallization 61
 Franciscan Complex 235
 freezing horizon 25
- gabbro-peridotite contact 36
 gabbro-peridotite transition 71
 gabbros
 Kizildag 46, 48, 54
 leucocratic 46
 plating 26
 Troodos 154
 Galapagos, Mn-rich deposits 218
 galena 185
 gangue minerals 191
 Gastropoda, endemism 274, 279–281
 gastropods 260, 263, 267
 gene flow 283
 geochemical proxies 203
 geochemical trends, Pitharokhoma pipe 160
 geological sections, segments OH1 and OH3 6, 7
 glasses, Troodos 163, 164, 167
 goethite 191, 205, 209
 Gondwana
 northwest margin 62
 rifting 220, 271
 Gorda Ridge spreading centre 189
Gorgoleptis 279
 gossans 201, 203, 204, **208**, 212, 213
 grabens, symmetric 29, 53
 gravity lows, ‘bull’s eye’ 5, 10
 Greece, tectonic map 220
 greenschist facies 38, 83, 92, 94, 128, 146
 groundwater flow, fault control 31
 growth faults 54
 Guaymas Basin 195, 265
- Gulf of Corinth 222
 gyrolite 93
- haematite, *see* hematite
 half-grabens 29
 harzburgite 33, 46, 61, 154
 Hayes fracture zone 1, 2
 haystacks 8, 9
 HEAT cruise 2
 heat flow
 Buried Basement transect 106
 hydrothermal systems 217
 Hydrothermal Transition transect 103
 ODP sites 504 and 896, 83
 heat loss, ridge flanks 99
 heat source, Troodos 147
 heat transport, fluid flow 88
 heavy rare-earth elements, Kizildag 58
 hedenbergite 185
 hematite 110, 115, 205, 246
 Hemichordata, endemism 282
 Hess Deep 44
 HFS, *see* high-field strength elements
 high-field strength elements, Kizildag 58
 highly altered rocks 94
 hornblende, aluminous 38
 horst and graben structures
 Kizildag 53
 OH1 segment 5
 OH3 segment 10
 hotspots, crustal thickness 77
 HRE, *see* heavy rare-earth elements
 hyaloclastites
 Juan de Fuca Ridge 106, 107
 OH1 segment 6, 8
 hydrogen sulphide 283
 hydrogenetic processes 230
 hydrothermal alteration
 axial 153
 and crustal age 122
 evolution 119
 late phase 121
 low temperature 107
 oceanic crust 75
 open 120
 restricted 120
 sheeted dykes 88
 hydrothermal chimneys
 collapsed 188, 191
 OH1 segment 6
 Urals 241
 hydrothermal circulation 54, 115
 diffuse 195
 duration 148
 geometries 129
 high temperature phase 131
 homogeneous 142, 148
 Juan de Fuca Ridge 103
 lateral 187
 sediment control 196
 Troodos 172
 upper crustal layer 82
 hydrothermal deposits, compositional variation 226

- hydrothermal fluids
 - composition 76, 118, 123
 - convection rates 122
 - downwelling 136
 - evolution 81, 204, 213
 - lateral extent 187
 - low-temperature 217
 - off-axis 218, 233
 - pipe-like structures 147
 - rapid cooling 252, 253
 - rare earth elements in 204
 - temperature 82, 189
 - upwelling 129
 - see also* fluid
- hydrothermal flux, estimates 128
- hydrothermal reworking 186
- hydrothermal systems
 - structure 129
 - thermal structure 130
- Hydrothermal Transition transect 100, 101–103
- hydrothermal vents
 - initiation by drilling 178, 187
 - intensities 17, 20
 - Lucky Strike segment 2
 - ODP deposit 178
- hydrous component, Kizildag 63
- hypercapnia 284
- Iberian margin 77
- Iceland, dyke injection 31
- iddingsite 110, 115
- illite 159, 169
- imbrication 53, 221
- immobile elements 160, 169
- impermeable horizons 187, 188
- incompatible element ratios 58
- interstitial fluids, geochemistry 187, 193
- iron oxyhydroxides 110, 115, 120
- isochron diagram, Troodos 144, 146
- isocubanite 181, 191, 247, 250, 251, 257
- isostatic uplift 53, 56
- isotope chemistry, chimney spires 249–240
- isotopic tracer transport model 128, 135
- Izu-Bonin arc 229
- jarosite 203, 213
- jasper, Troodos 157, 170
- Josephine ophiolite 32, 54, 78
- Juan de Fuca ridge 31, 99
 - analytical techniques 107
 - cross-section 102
 - geological setting 100
 - lithostratigraphic logs 103
 - Middle Valley 177
 - Mn-rich deposits 218
- juvenile arc model 62
- K-Ar ages, alteration minerals 142
- Kane fracture zone 31
- Kane Transform 54
- Kizildag Ophiolite 43
 - cross-sections 47, 55
 - evolution 62–65
 - geological map 45
 - location map 44
 - planar fabric elements 50
 - structural evolution 56
 - structure 46
- Kömürçukuru 52
- Krasnogvardeyski 263
- Kuroko deposit 241
- La/Nd ratios 211
- La/Sm ratios, Kizildag 58
- Labrador Sea rift 77
- Lamellibrachia* 275
- landslips 40
- large-ion lithophile elements, Kizildag 58
- laser ablation mass spectrometry 159–160
- Latimeria* 271
- Lau Ridge 219
- laumontite 91, 94, 143
- lava lakes
 - founded 5
 - Lucky Strike segment 10, 14
 - Mid-Atlantic Ridge 2
- lava tubes 9, 14
- lavas
 - age of 17
 - alteration 157
 - constructional 13, 14
 - Jurassic 222
 - lobate 5, 14
 - mixed-layer 163
 - rugged-flow 5
 - sheet-flow 5, 8, 13
- layer 3
 - models 72
 - P-wave velocities 78
 - seismic velocities 3, 71, 75, 77
- layering, cryptic 25
- leached facies, Pitharokhoma 157, 160, 167, 169
- lead, *see* Pb
- Lepetodrilus* 279
- Lepetopsis* 279
- lherzolite 33, 46
- light rare-earth elements, Kizildag 58
- LIL, *see* large-ion lithophile elements
- limonite 191
- listric faults 50
- lithological units, ODP Leg 168, **104**, **105**
- lithosphere
 - Neo-Tethyan 45
 - strength of 31, 39
- lithosphere thickness, segment ends 40
- lithostatic head 12
- lithostratigraphic logs, Juan de Fuca ridge 103
- Lizard Complex, map 32
- Lizard ophiolite 32–33
 - block diagram 33
 - orientation diagrams 34
- Ljeviha 263
- location map 2
- Loihi Seamount 219
- low velocity zone 52
- lowstands, Pleistocene 189
- LRE, *see* light rare-earth elements
- Lucky Strike segment 1, 2, 5

- geology 9
- sidescan sonar results 10
- source 13
- TOBI images 8
- LUSTRE 96 cruise 10
- magma chambers
 - East Pacific Rise 52
 - processes in 26, 44
- magma lenses, axial 52
- magma supply
 - at fast-spreading ridges 52
 - at slow-spreading ridges 29
- magmatic sources
 - along-strike movement 10
 - Kizildag 58
 - single 14
- magmatic-deuteric fluids 119
- magnesium, *see* Mg
- magnetic anomalies
 - ODP Leg 168, 101
 - seafloor spreading 77
- magnetic measurements, resolution 75
- magnetite 181, 185
- Magnitogorsk 262
- major element analysis, Kizildag 57, 59
- malachite 52
- Mamonia Complex 233, 237
- manganese, *see* Mn
- mantle Bouguer anomalies, MAR 1, 5, 10
- mantle decompression 74
- mantle diapirs 10
- mantle melting models, Kizildag 61
- mantle/pluton contacts 54
- marcasite 186, 191, 247, 252
- MARFLUX programme 1
- Mariana arc 229
- Mariana Trough 61
- MARK area 31, 44
 - core samples 54
 - cross-sections 47
- MARNOK area 31
- mass extinction
 - and carbon dioxide 284
 - evasion of 284–285
 - K-T 284
- mass spectrometry, Pitharokhoma samples 159
- mass wasting deposits 180, 202, 203
- median ridge, segment OH1 5
- median valleys 54
- Melanodrymia* 281
- melt body, AMC 22
- melt layer thickness 25, 74
- melt migration 32
- melt topology 25
- melt volumes 26, 61
- melting models 58
- Mendocino Fracture Zone 189
- Menez Gwen segment 6
- mesostasis 115, 116, 121, 142
- metadolerite 49
- metal distribution, in sulphide deposits 186
- metal ions, down-core variation 206
- metal remobilisation 203, 213, 230, 234
- metamorphic rocks, Mn-rich 234
- metamorphism, high-temperature 53
- Metasequoia* 271
- metasomatism 61, 63, 156, 157
- Mg, in hydrothermal fluids 188
- Mg-saponite 85
- MgO content, basalt 17, 31, 58
- microbial filaments 260
- microprobe analyses, Juan de Fuca Ridge 107, **108**, **109**, **110**, **111**, **112**, 116
- Mid-Atlantic Ridge
 - faults 44
 - TAG mound 202
 - variability along 1
- Mid-Cayman Rise 53
- mid-ocean ridges
 - fast-spreading 17
 - slow-spreading 29
- Middle Valley, Juan de Fuca Ridge 177, 178
- mineral colour, and alteration 118
- mineral precipitation 81
- mineral recrystallization 128, 139, 143, 144
 - rates 150
 - temperatures 146
- mineralization sequences 213
- mineralized zones, Kizildag 52
- Miura spinosa* 276
- Mn
 - enrichment 206, 213, 218, 222, 235
 - fractionation 219
 - Kizildag 52
 - mining 222
 - precipitation 210, 217
- Mn ores 233
- Mn-cherts
 - electron microprobe analysis 226–229, **228**, 231
 - fractionation 234
 - geochemistry 223–226
 - hydrothermal origins 232
 - lamination 234
 - major and trace elements **225**, 226, 227
 - Neo-Tethys 218, 220, 221
 - origins 229
 - petrography 223
 - photomicrograph 224
 - sedimentary log 224
 - SEM study 227, 229, 230, 232
 - settings 235
 - stratigraphic sections 223
 - ternary plots **229**
- Mn-nodules 234
- Mo/Fe ratios 203
- Modiomorpha mytiloides* 263
- Moho
 - nature of 71
 - North Atlantic 76
 - ODP Hole 735B 75
 - petrological 33
 - thickness 52
- monoplacophorans 243, 263, 265, 267
- MORB 58
 - Greece 233
 - rare-earth elements 71, 154
 - Sr isotope ratios 84, 94

- mordenite 165, 170
 Mugodjarian zone 262
Munidopsis 282
 mylonite
 gabbroic 33, 35
 Kizildag 46
 mylonite/gabbro contact 37
- Na values, crustal thickness 72, 74
 natrolite 87, 88
 necking 54
 Neo-Tethyan lithosphere 45, 62
 Neo-Tethys
 basin 221–222
 Mn-cherts 220
 reconstruction 64, 233
 seafloor spreading 236
 subduction 234
 see also Pindos Ocean
Neobrachylepas 277
Neolepas 277, 278, 279
Neomphalus fretterae 280
Neopilina 271
Neoverruca 277, 278
Nereis 283
 Newfoundland margin 77
 normal faults 29, 39, 53, 178
- Oasisia* 263
 obduction processes 45
 oblique faults, Kizildag ophiolite 46
 oblique-slip faults 55, 56
 Ocean Drilling Program 33
 see also ODP
 ocean stratification 284
 OCEANAUT cruise 1
 oceanic crust
 accretion of 17
 alteration zones 82
 comparison with Kizildag 52
 formation of 44
 models 72
 thermal evolution 149
 thickness 71
 three-layer model 71
 velocity structure 76
 oceanic lithosphere, structural models 44
 Oceanographer fracture zone 1
 oches
 and black smokers 217, 218
 Cyprus 201
 formation 202, 211
 and massive sulphides 233
 ODP Hole 504B 81
 lithostratigraphy 84
 location 83
 sample 90
 ODP Hole 735B, bathymetry 73
 ODP Hole 896 82
 location 83
 ODP Leg 158 156
 ODP Leg 168 99
- location map 100
 tabular data 104, 105
 ODP Leg 169 177
 location maps 178, 179
 offsets, axial 52
 OH1 segment 1, 5
 section 6, 7
 OH3 segment 1
 section 6, 7
 Oktyabrsk 262
 Oman, *see* Semail
 ophiolite belts
 Greece 233
 peri-Arabian 46
 ophiolites
 Apennine 234
 fossils 260
 harzburgite-type 77
 Josephine 32, 54, 78
 Kizildag 43
 lherzolite-type 77
 Ligurian 234
 Lizard 32–33
 Mn deposits 235
 Oman, *see* Semail
 Pindos 201
 Semail 25, 46, 201, 205, 233, 260
 as structural analogues 44, 71
 Tethyan area 219
 Troodos 46, 62, 63, 127, 201, 260
 Zambales 260
 ore bodies
 Yaman Kasy 242, 251
 zoning 210
 orogenic belts 232
 Othris 233, 236
 oxidative haloes 113
 oxyanions 203
 oxygen isotope fractionation 75
 oxygen isotope studies 87, 88
- P-wave velocities, layer 3, 78
 P/Fe ratios 203, 208, 209, 210, 213
Pabulum spathiforme 278
 Pacific seamounts
 Fe-rich sediments 219
 rare-earth elements 212
 Pangaea, break-up 62
 Papuan peninsula 63
 paragenesis 141
Paralvinella sulfynicola 265
 partial melting, seismic velocities 23
 passive margins 233
 Patras 221
 Pb, in massive sulphides 186, 195, 196
 peak-to-trough anomalies 5
 Peloponnese 220
 cross-section 222
 geological map 221
 peridotite
 feldspathic 46
 partial melting 23
 serpentinised 33, 44, 52, 56, 71, 75, 77

- Troodos 154
- Peristerka 260
- permeability
 - boundary layer 129
 - and crustal structure 103
- permeability-depth relations 77, 82, 94
- petrogenesis, Kizildag magmas 58
- phillipsite 115, 116
- phyllosilicates 110
 - rare-earth elements in 211
- Pico offset 1
- pillow lavas
 - FAMOUS segment 14
 - fluid flux in 130
 - Juan de Fuca Ridge 106
 - Kizildag 51, 52, 55
 - OH1 segment 6, 8
 - OH3 segment 8
 - Sr isotope ratios 131
- Pindos Ocean 221, 222, 234, 236
- Pindos ophiolite 201
- Pitharokhoma alteration pipe
 - major and trace elements **161**
 - map 157
 - mineralogy **156**
 - rare earth elements **162, 163, 164, 165, 166, 168**
 - samples **158, 159**
- plagioclase, recrystallization 93, 195
- plagiogranite 46, 154
- plate separation
 - and magma supply 53
 - role of faults in 29, 40
- plesiomorphism 272, 275
- plume deposits, umbers 218
- plume fallout 202, 203, 204, 210
- plutonic rocks, Kizildag 46
- plutons, gabbroic 71
- PO1 segment, *see* Lucky Strike segment
- Pocklington rise 63
- Pogonophora, endemicity 274–275
- Polychaeta, endemicity 274, 275–276
- polychaetes 260, 263, 265, 267
- pore fluids 177, 187, 193, 195, 196, 197
- pore-filling, anhydrite 92
- porosity
 - boundary layer 129, 138
 - fault zones 188
- porosity-depth relations 82
- prehnite 93
- primitive mantle 61
- Provanna* 280
- pyrite
 - alteration zones 116
 - analyses **254**
 - Bent Hill 185, 191
 - bladed 252, 257
 - honeycombed 245, 256
 - massive 246
 - TAG site 203
 - Troodos 156, 167
 - in umbers 52
 - Urals 242, 245, 246
- pyrite-marcasite 181, 185
- pyrolusite 227
- pyrrhotite 181, 184, 191
- quartz, alteration mineral 110, 116
- quartz veins 90, 91
- radiolarians 213, 222, 230, 235
- rare-earth elements
 - in alumino-silicate phase 210
 - black smokers 153, 154, 169
 - co-variation 211
 - East Pacific Rise 212
 - fractionation 204, 211, 213
 - Kizildag 58
 - mobility 153, 170, 171
 - MORB 71
 - Pacific seamounts 212
 - partitioning 170
 - in phyllosilicates 211
 - Pitharokhoma 159, 163, 164, 165, 166, 168
 - ranges 212
 - in seawater 154, 167, 204
 - as tracers 204
- Rb-Sr ages, alteration minerals 142
- Rb-Sr evolution 138
- reaction zone 83, 94
- recharge
 - cooling effect 147
 - pervasive 138
- recharge fluids 85, 92, 93
 - geometry 128, 129
 - in hydrothermal flow 130
- recharge flux 136
- recharge zone 84
- Red Sea 212
- redox conditions 210, 211
- reflector, axial magma chamber 17
- refugia 268, 282, 284
- relic taxa 259, 271, 275
- replacement deposits 156
- research vessels
 - Atlantis II* 204
 - Discovery* 74
 - l' Atalante* 2
 - Nadir* 1
- resistivity 188
- retrograde solubility 92
- rhodochrosite 235
- rhyolite 242
- ridge axis, cross-section 38
- ridge crests 17, 44
- ridge flanks
 - fluid fluxes 99
 - heat loss 99
 - hydrothermal circulation 88
- ridge segmentation 56
- Ridgeia* 260, 263, 265, 266, 275
- rift valley
 - segment OH1 5
 - segment OH3 5
- Riftia pachyptila* 260, 264, 266, 284
- rifting 53
 - Gondwana 220
 - Mediterranean 62
- rifts, extinct 77

- Rimicaris* 277
 RNA, sequence analysis 275, 278, 279, 280–281
 Rough Basement transect 100, 106
- Safyanovka 262
 sakalavites 52
 Sakmara zone 242
 salinity, fluid inclusions 250
 sampling bias 84
Santalema miraseta 276
 saponite
 alteration phase indicator 110, 119, 120
 association with carbonate 88
 association with chlorite 115
 association with pyrite 116
 formation temperature 121
 Sr signature 86, 142
 see also Mg-saponite
Saxipendium coronatum 282
 scavenging mechanisms 170
Scillaelepas 278
 seafloor spreading
 Kizildag ophiolite 46
 magnetic anomalies 77
 Neo-Tethys 236
 seamount chains
 offset 31
 segment OH1 5
 seamount complex, Lucky Strike segment 10
 seamounts
 fault-associated 31, 40
 flat-topped 31
 Mid-Atlantic Ridge 30
 off-axis 219
 seawater
 downward diffusion 211
 entrainment 203
 REE 154, 167, 204
 Sr ratios 86
 seawater penetration 77, 82
 secondary minerals 81, 82
 fluid composition 94
 Juan de Fuca Ridge 110, 117
 progressive change in 123
 sheeted dykes 88, 89
 Sr ratios 86, 87
 textural variations 118
 sediment hills 189
 sedimentary cover
 Gorda Ridge 189
 Juan de Fuca Ridge 103
 Kizildag 53, 56
 OH1 segment 5
 sedimentation rates, Juan de Fuca Ridge 180
 sediments
 alteration 190, 195, 196
 interstitial 167
 seep faunas 272, 274, 275, 276, 280, 282, 283
 segment ends
 lithosphere thickness 40
 lithospheric strength 31
 segment evolution 14
 segments
 East Pacific Rise 27
 fourth-order 19, 27
 lengths 29
 segregation, fluid phase 193
 seismic data, possible errors in 21
 seismic profiles, East Pacific Rise 19, 20
 seismic reflectors
 axial magmatic chamber 17–28
 crustal 44
 deep 39
 seismic velocity
 layer 3, 71, 75, 77
 melts 22, 23
 Semail Ophiolite 25, 46, 201, 205, 233, 260
 serpentinisation 33, 56
 conditions for 75–76
 Josephine ophiolite 78
 tectonic settings 76–77
 serpentinisation front 71, 77
 serpentinite, Troodos ophiolite 154
 shear, sense indicators 54
 shear strain 39
 shear zones
 fluid channelling 135
 gabbro-filled 32, 35
 hydrated 37, 39
 Kizildag 46, 49, 51
 seismic reflectors 40
 sheeted dykes
 hydrothermal alteration 88, 89, 131, 145
 injection processes 26
 Josephine ophiolite 54
 Kizildag 47, 49, 50
 Lizard 33
 ODP 504 and 896, 83
 Sr ratios 86, 93, 130, 139, 147
 Troodos 54, 133, 155
 Sibay, fossils 262, 263
 SIGMA cruise 2
 silica
 biogenic 232
 precipitate 203
 sill/sediment complex 181
 sills
 axial magma chamber 17, 25, 26
 basalt 192
 Skouriotissa 209, 212, 213
 slab window 63
 slickensides 50, 54
 slumping 202
 smectite, Pitharokhoma 163, 164, 170
 Snake Pit vent field 171
 sonar, side-scan 1, 2, 10, 30
 Southern Explorer Ridge 212, 213
 Southwest Indian Ridge 29
 melt migration 32
 shear zones 54
 tectonic stretching 44, 53
 Sovanco transform fault 177
 sphalerite
 Bent Hill 181, 185, 186, 191
 collomorphic 247
 dissolution 203
 Urals 242, 245, 252
 spreading centres 54, 63

- spreading rates
 Gorda Ridge 189
 Juan de Fuca Ridge 100
 Southwest Indian Ridge 74
 Sr budget, global 94, 127
 Sr exchange, timescale of 89
 Sr isotope profile, upper oceanic crust 84, 85
 Sr isotope studies 81
 analytical methods 132–133
 Troodos ophiolite 128
 Yaman Kasy 256
 Sr partition coefficient 131
 Sr ratios
 dykes 145
 pillow lavas 131
 secondary minerals 86, 87, 93
 transport model 131
 Troodos ophiolite 130, 134–135, 136, 137–138, 139,
 143, 144, 146
 variation with depth 91
 Sr/Ca ratios 93
 stockworks 82
 MORB extrusives 233
 sulphide deposits 84
 Troodos ophiolite 154, 155, 156, 171
 Urals 242
 stress modelling 31
 strontium, *see* Sr
 structural evolution, Kizildag Ophiolite 56
 sub-basement, Sr ratios 86
 subducting slab, metasomatism 61, 63
 subduction, Neo-Tethys 234
 subduction zone, oblique 62
 submersibles, *Nautila* 1, 5
 sulphide deposits
 Central Hill 191
 clastic 180
 Devonian 262
 disseminated 191, 212
 fault-associated 54
 formation depth 255
 fossiliferous 260
 Kizildag 52
 layered 245
 lenses 241, 242, 256
 Lucky Strike segment 2
 massive 177, 181, 235, 242
 metal distribution in 186
 mineralization and geochemistry 184
 ODP Hole 504B 91
 Silurian 263
 stacked 181, 188
 stockworks 84
 Troodos 155
 sulphide feeder zones 181, 188
 sulphide grains, graded 242
 sulphide tolerance, vent communities 283
 sulphide toxicity 283
 sulphophile faunas 274, 283
 sulphur
 igneous source 255, 257
 native 191
 sulphur isotopes 93, 250, 255, 256
 suprasubduction 63, 65, 128, 155, 212
 symbiosis, vent communities 283
 symmetry, extrusives 10, 12
 TAG 55, 76
 major and minor elements 205
 ochres 218
 rare-earth elements 207, 208
 sulphide mound 156, 202, 243
 Tahtaköprü fault 46, 52, 54, 56
 talc 110, 116
 talus ramps 8, 40
 Tauride platform 63
 taxonomic characters, vent fossils 266
 tear faults, Kizildag 53
 tectonic features
 MAR 5
 segment OH3 10
 tectonic stretching 44, 53
 magnitude 56
 tectonites 33, 36, 46
 tectosilicates 110, 116
 tellurides 247, 249, 253, 253, 254, 257
Temnocinclus 279
 temperatures, black smokers 90
 terrigenous processes 229
 Tethyan area, ophiolites 219
Tevnia 260, 263
 thermal burst, Troodos 63
 thermal evolution, crust 149
 thermal modelling, fluid fluxes 127
 tholeiites 222
 thrust faulting 53
 thrust sheets, Greece 220, 221, 233
 thrust stack 222
 thrusting, in-sequence 221
 Ti depletion, Kizildag 61
 Ti/Zr ratios 58
 TOBI 1, 2
 TOBI images
 FAMOUS segment 12
 Lucky Strike segment 8, 10
 Tonga Ridge 219
 trace element analysis, Kizildag 57, 60
 Trans-Atlantic geotraverse, *see* TAG
 transfer faults 56
 transform faults 52, 54
 transition zone, Sr ratios 84, 85
 troctolite 33
 Troodos Massif 128
 Troodos ophiolite 46, 62, 63, 127
 age of 133
 alteration pattern 148
 Basal Group 136, 143
 cumulates 154
 dyke-pluton transition 136
 fluid fluxes 131
 fossils 260
 geological map 133, 155
 rare-earth element mobility 153
 sampling maps 140, 141
 serpentinite 154
 Sr isotope studies 128
 Sr ratios 130
 stockworks 154, 155

- sulphide deposits 155
 - Upper Pillow Lavas 63, 143
- tubes, characteristics **261**
- turbidites, Juan de Fuca Ridge 103, 178, 179
- Twin Hills segment 6
- U enrichment 203
- U/Fe ratios 203, 206, 209
- ultramafic/mafic contact 33
- ultramafics, fabric 35
- ultramylonites 36
- umbers 52, 201, 217
 - distal deposition 233
 - plume deposits 218
- up-flow zones 119, 157
- Upper Pillow Lavas, Troodos 63
- upwelling, hydrothermal fluids 129, 138
- Uralian Ocean 242
- Urals
 - geological map 242
 - hydrothermal chimneys 241
- Uzgelga 262
- V/Fe ratios 203, 208, 209, 210, 213
- valleys, fracture zone 76
- Valu Fa Ridge 219
- vein minerals, Sr ratios 94, 138
- veinlets 86
- veins
 - cross-cutting 84
 - Kizildag plutonics 46
 - upper crust 82
 - Urals 242
- velocity models, AMC 22, 23
- velocity/temperature curves 24
- vent communities 259
 - colonisation 283
 - endemism 274
 - faunal origins 282
 - fossil and modern 267
 - mosaic origins 285
 - physiological barriers 282–283
 - sulphide tolerance 283
 - symbiosis 283
 - taxonomic comparisons 267
 - see also* faunas
- vent sites, fossilization at 264–266
- vesicle filling 115, 116
- Vesicomya* 281
- vesicomysids 263, 281
- vestmentiferans 260, 263, 264, 266, 267, 274
 - see also* Pogonophora
- Vetigastropoda 279
- volcanic cycles 19
- volcanic evolution, three-stage 17
- volcanic ridges
 - FAMOUS segment 14
 - Lucky Strike segment 2, 10
 - OH3 segment 8
- volcanism
 - explosive 6
 - off-axis 236
- volcano-tectonic variations, sketch sections 11
- volcanoes
 - conical 9
 - fissure 31
 - Lucky Strike segment 2
- vugs 86, 87, 185, 191
- W-Seamount 31
- Waikalasma* 278
- wall rock alteration 157
- water
 - in lower crust and mantle 39
 - see also* fluid, hydrous, seawater etc
- water-rock ratios 120, 121, 130, 172
- waveform inversion procedure 22
- waveforms, AMC 20, 21
- weathering, TAG mound 203, 209
- wehrlite 46
- West Antilles arc 229
- West Valley 178
- white smokers
 - EPR 20
 - TAG site 205, 210
- Woodlark basin 63
- worm tubes 243, 255, 260
- wurzite 185, 247
- xenoliths, ultramafic 35
- Yaman Kasy 241, 242, 251
 - footwall 244
 - fossils 263, 264, 265
 - geological map and section 243
- Yubileinoe 262
- Zambales ophiolite 260
- zeolites 110, 116, 136, 142, 147, 165
- Zn, in massive sulphides 186, 188
- Zuha gossan 205, 212, 213
 - geochemistry **208**