

# Index

Page numbers in *italics* refer to Figures, while those in **bold** denote Tables.

- accumulation rates 2–3, 341–2
- acicular gypsum 201, 203
- Africa *see* North Africa; South Africa; West African margin
- age data 24, 28, 31–2
- alabaster facies 133–4, 227
- Algeria, Berkine/Ghadames Basin 87–105
- allochthonous gypsum 117–18, 200, 207, 209
- analogues *see* modern analogues
- Angola margin 26
- anhydrite
  - Bilche–Volytsya zone, Ukraine 322
  - breccia 317
  - Carpathian Foredeep Basin 108, 109
  - Dhiban Formation 59, 60, 61, 62
  - Great Kavir Basin 76, 78
  - isotopic composition **257**
  - nodules 175, 176
  - Permian Basin 337, 340
  - Poland 277
  - pseudomorphs 346, 347
  - rehydration 203–5
  - Ukraine 267, 269, 270, 317, 320
  - Zbudza Formation 254, **257**
- anhydrite–carbonate couplets 8
- anhydrite–carbonate–halite triplets 8
- anhydrite–halite laminates 359–60
- anoxia 236–7
- anoxic monimolimnion 236–7
- antiform structures, calcite 293, 300, 302
- Anzano Molasse 194–5, 196
- Apennines *see* Southern Apennines
- Aptian salt basin 24–8, 31
- aragonite 147
- Aral Sea 236
- Argilles Vertes Formation 20, 24
- Artemivs'k rock salt deposit, Ukraine 314
- authigenic mineralization 313
- autochthonous gypsum 117–18, 200, 207–8, 209
- autoclastic breccias, calcite 291
  
- Badenian evaporite (meromict) basins
  - Carpathian Foredeep 4, 219–46
    - brine transport 238–40
    - evaporites distribution 220, 221
    - halite crystallization 221, 240
    - hydrographical model 230–1
    - mixolimnion 231, 235–6
    - modern analogues **232–4**, 236
    - monimolimnion 236–7
    - subbasins 221
  - East Slovakian Basin 247–64
  - Ukraine 268, 319
- Badenian gypsum facies 4, 107–42, 116
  - clastic gypsum (allochthonous) 117–18
  - coarse-crystalline selenite 118–24
  - glass-like selenite 124–7
  - lithosomes 117–18
  - microbialite 117–18
  - stratigraphy 119, 240–1
  - see also* salina-type evaporite basin
- banded halite facies 171, 173
- Barremian sediments 31
- base-level oscillations 210, 211
- basement morphology, South Atlantic 25–8
- basins
  - Badenian evaporite basin 219–46
  - Berkine/Ghadames Basin 87–105
  - Carpathian Foredeep Basin 107–42, 219–46, 265–73, 318–23
  - East Slovakian Basin 247–64
  - Great Kavir Basin, Iran 69–85
  - Kirkuk Basin, Iraq 53–68
  - Permian Basin, USA 335–64
  - pre-salt sag basins 15–35
  - salina-type 107–42
- bassanite 322
- Berkine/Ghadames Basin 87–105
  - evaporite cycles 93–6
  - lithostratigraphy 90, 91
  - palaeogeography/evolution 98–9, 100–1
  - seismic stratigraphy 91–3, 94–5
  - sequence stratigraphy 96–8
- Bilche–Volytsya zone, Ukraine 320–3
- bloedite 150, 152
- bottom dissolution fabrics 347–50
- bottom-growth deposits
  - calcite–anhydrite 358
  - fabrics 344–7, 348–9
  - gypsum 200, 225, 237
  - selenite 112–15
- Brazilian continental margin 17
  - pre-salt sag basin deposits 19–20
  - seismic reflection profiles 21–3
  - topography 28–31
- breccias
  - anhydrite 317
  - autoclastic 291
  - calcite 291, 302
  - carbonate 155–68, 198–9
  - collapse 302
  - from dissolution 159, 160, 166
  - halite facies 172, 175
  - microbreccias 161
  - Monte Castello evaporites 209
- brine flows
  - downslope transport 238–9
  - halite zone 228–30
  - Halych, Ukraine 227–8
  - meromict basins 239–40

- brine flows (*Continued*)  
 mixolimnion 231  
 orientation 219–20  
 swirl pattern 228
- brine inclusions *see* fluid inclusions
- brine sheets, majanna-type shoals 111, 115–17
- brines  
 density stratification 343–4, 360  
 Great Kavir Basin 81–3  
 transport concepts 238–40  
 Ukraine 270, 329
- bromine  
 fluid inclusions 280, 282  
 in halite 78–9, 81, 358–9  
 rock salt 255, 257, 268, 317, 329
- Burdigalian stage  
 basin configuration 55–64  
 Kirkuk Basin 53–68  
 marine transgression 66
- CaCl<sub>2</sub> hydrothermal brines 80, 81–3
- Calabria, Italy, Messinian halite facies 169–78
- calcite  
 herringbone structure 289, 294, 296–301, 303–5  
 mosaics, Neoproterozoic 296–301  
 nodules 288, 292, 296  
 pseudomorphs 287  
*see also* carbonates
- calcite–anhydrite cumulate couplets 346, 358, 359
- calcite–anhydrite–halite triplets 358
- calcium sulphate *see* anhydrite; gypsum; selenite
- Campbellrand Subgroup, South Africa 286
- Campos basin, Brazil 20, 28–31
- cap rocks, residual halite facies 174, 175, 176
- carbon isotopes, carbonates 183, 188
- carbonate–anhydrite cycles 96
- carbonates  
 ‘B marker’, Berkine/Ghadames Basin 93–6  
 Bilche–Volysya zone, Ukraine 320  
 breccias 155–68, 198–9  
 conglomerates 155–68  
 former evaporite features 285–308  
 Great Kavir Basin 78  
 Kirkuk Basin 53–68  
 oxygen and carbon isotopes 182–3, 188  
*see also* calcite; dolomite; limestones
- carnallite 76–7, 267, 268, 323, 324
- Carpathian Foredeep Basin  
 Badenian gypsum facies 4, 107–42  
 Badenian meromict basin 219–46  
 evaporites distribution 116, 220, 221  
 selenite facies 4, 118–37  
 Ukraine 265–73, 318–23
- Castile Formation, USA 358–9
- cauliflower (cavoli) structures 292, 301
- Central Ebro Basin, Spain 143–54
- chambersite 324–5
- channel structures 133–5
- channel-mouth lobe deposits 37–52
- Chela unconformity 22, 28
- chemocline 230, 231  
*see also* pycnocline
- chevron structures, halite 78, 253, 254, 257, 275, 278–80
- chicken-wire structures 295
- chlorides  
 Bilche–Volysya zone, Ukraine 322–3  
 brines, Ukraine 270  
 Great Kavir Basin 74–8  
 Zbudza Formation 248, 249–54
- clastic evaporites 169, 347  
 gypsum 136, 205, 206  
 halite 249–54
- clastic lobe deposits 37–52  
 depositional environment 46–50  
 ellipsoidal mounds 39–41, 43, 46  
 ribbon-shaped bodies 41–3, 46, 48
- clay laminae 322
- clear halite facies 171–2, 173–4
- coarse-crystalline gypsum 322, 328
- coarse-crystalline selenite 114, 118–24
- collapse breccias 302
- columnar structures 302–3
- conceptual models, salina-type  
 basin 107–11
- constructional clastic depositional body 43–6
- continental extension, South Atlantic 20–3, 25–7
- continental red bed facies 70–3
- Coriolis effect 238
- Crimea 319–28, 326
- Crotone basin, Calabria 169–78  
 halite facies 171–4  
 residual facies 174–6
- crustal thinning, South Atlantic margins 20–3, 25–7
- crystallization *see* individual minerals
- cumulate deposition 344, 345, 346, 358–60
- cyclicality  
 Berkine/Ghadames Basin 93–6  
 Castile Formation, USA 358–9  
 Messinian evaporites 181  
 Permian Basin 339  
 selenites 212  
 Zbudza Formation 254–6, 261  
 Zechstein evaporites 277
- d’ansite 76, 77, 78
- Daunia tectonic unit 196
- debris flows 20
- dedolomitization 165
- deep-brine pans  
 coarse-crystalline selenite 118–24  
 depositional model 123
- deep burial alteration 6
- deep water  
 facies 7, 8, 31, 93  
 fabric criteria 342–4, 356  
*see also* monimolimnion
- deformation  
 calcite 302, 304–5  
 halite 173, 177
- Delaware Basin, USA 336
- Delaware Mountain Group, USA 357–8
- density stratification in brines 343–4, 360
- deposition  
 deep water 342–4, 356  
 models 80–1, 82, 123, 260  
 rates 2–3  
 shallow water 344–50

- styles 5–6
- see also* redeposition
- depth indicators 335–64, 356
  - accumulation rates 341–2
  - fabric criteria 342–56
  - methods of determination 337–41
- detrital pseudocarniole 161–3, 166
- Devonian evaporites, Ukraine 312–15, 328
- Dhiban Formation, Iraq 59–64
- diachronous basin development 18–19, 24, 31
- diagenetic features, Neoproterozoic carbonates 287, 288, 301–4, 305
- diapirs
  - Crotone basin 170, 171, 174, 177
  - Dniro–Donets depression 311–12, 313, **314**
  - Iran 69, 71
  - Transcarpathian trough 326
  - see also* salt domes
- diatomite–carbonate–gypsum sequence 211
- directional structures 224, 225–8
- dissolution
  - bottom fabrics 347–50
  - carbonate breccias 159, 160, 166
  - dolomite 165
  - gypsum/anhydrite 164–5
  - halite 177
  - pipes 351, 352
  - pits 351–2, 352–3, 356
  - residual pseudocarniole 159–61, 166
- dissolution surfaces
  - bottom growth 349–50
  - coarse-crystalline selenite 118–24, 119, 122
  - microbial mats 122–3, 124
- distal sector evaporites 211
- Djeno Formation 19, 20
- Dniro–Donets depression, Ukraine 310–15
  - Devonian evaporites 312–15
  - Permian evaporites 313–15
- dolomite 60, 62, 165
  - see also* carbonates
- dolomitization 287, 290, 301
- downslope deposition 344
- downslope transport 238–9
- drawdown
  - Aptian salt basin 27–8
  - Badenian evaporite basin 108, 109
  - Late Messinian 211
  - see also* water-level fluctuations
- East European platform 316, 319
- East Slovakian Basin
  - geology 247–8
  - salt facies deposition model 260
  - Zbudza Formation 247–64
- economic deposits *see* industrial deposits
- El Arish–Afiq Canyon 40, 42, 43, 44, 48–9, 48, 49
- ellipsoidal mounds, clastic lobe deposits 39–41, 43
- emersion events, shallow-brine pans 130–3
- encrusting pseudocarniole 163, 164, 166
- enterolithic structures 295–9
- Eocene
  - continental red bed facies 70–3
  - marine regression, Iran 70
- ephemeral (seasonally drying) lakes 131–3
- epsomite 147–8, 152, 268
- Erva Formation 20
- Euphrates Formation, Iraq 55–9
- euxinic monimolimnion 237
- evaporation rates 3
- Evaporiti di Monte Castello Formation 191–218
  - depositional setting 209–12, 210
  - diatomic and euxinic facies 198
  - evaporitic limestones 197, 198–9
  - geological setting 194–5
  - gypsum lithofacies 200–5, 211
    - stratigraphic relations 207–9
    - strontium geochemistry 205–7
  - pre-evaporitic lithofacies 198
  - regional tectonic control 212, 213
  - stratigraphy 196–200
  - tectonic setting 213–14
- experimental evaporation 143–54
- exposure depth indicators 350–6
  - above water table 351–2, 356
  - below water table 350–2
  - surface deposition 355–6
- extensional faulting 26
- Ezanga evaporites 20–5
- fabric criteria depth indicators 342–56
  - above and below water table 350–6
  - deep water 342–4, 356
  - distribution 357
  - shallow water 344–50, 356
- facies
  - Kirkuk Basin 56–9
  - 'pseudocarniole' 158–63, 166
  - tectonically active/passive basins 6–9, 8
  - see also* gypsum facies; residual facies; selenite facies
- Faeto Flysch 194, 196
- Famennian evaporites, Ukraine 313
- faunal assemblages, Kirkuk Basin **57**
- filamentous laminates 287–90
- fine crystalline halites 253, 254
- fine-grained gypsum microbialite 118
- flamboyant calcite 298, 301, 303
- floral assemblages, Kirkuk Basin **57**
- flows
  - debris flows 20
  - halite 173, 177
  - mud flow 261–2
  - see also* brine flows
- fluid inclusions
  - halite 79–80, 277–9
  - sylvite 79–80, 275–84
  - Ukraine evaporites 309, 315
- fold-and-thrust belt 194
- folded flysch 318
- foraminifera **57**, 58–9, 65
- Forecarpathian region, Ukraine 317, 323–5
- Foredobrogean trough, Ukraine 317–18
- Frasnian evaporites, Ukraine 312–13
- Gabon–Angola continental margin 16
- geochemistry
  - depth indicator 342
  - Great Kavir Basin 78–9

- geochemistry (*Continued*)  
 isotopes 187, 188, 205–7  
 modelling, natural brines 143–4  
 PHRQPITZ code program 144, 147  
 Zbudza Formation 256–7, 262
- geology  
 Badenian evaporite basin 220–5  
 Carpathian Foredeep Basin 266–8  
 Croton basin 169–70  
 East Slovakian Basin 247–8  
 Great Kavir Basin 69–74  
 Monte Castello evaporites 194–5  
 Romagna Apennines 180–1
- graben structures 70, 248, 310–11
- grass-like selenite facies 124–7  
 long-distance correlation 127, 128  
 sedimentary features 126
- gravity deposits 20, 344
- Great Kavir Basin, Iran 69–85  
 brine origin and evolution 81–3  
 carbonate unit 78  
 chloride unit 74–8  
 depositional model 80–1, 82  
 geochemistry 78–9  
 geology and stratigraphy 69–74  
 siliclastics 73, 78  
 sulphate beds 78
- Great Salt Lake, Utah 236
- gypsarenites 205, 206
- gypsilitites 205
- gypsrudites 205, 206
- gypsum  
 Bilche–Volytsya zone, Ukraine 322  
 bottom-growth 345–7, 348  
 cement 176–7  
 clastic 136, 205, 206  
 crusts 112–15  
 Dhiban Formation 59  
 Ebro Basin brines 147–8, 150, 152  
 enterolithic folds 295–9  
 Great Kavir Basin 76, 78  
 Kerch peninsula 327–8  
 monimolimnion 237  
 Monte Castello 199–200, 201, 203  
 nodules 175, 176, 203–5, 296  
 replacement 305  
 sulphur isotopes 183  
 turbidites 10  
 Ukraine 270, 317, 320
- gypsum facies  
 Carpathian Foredeep Basin 4, 107–42, 109, 220  
 Monte Castello evaporites 200–5, 207–9  
*see also* Badenian gypsum facies
- gypsum-anhydrite deposits 320–3
- halite  
 Badenian basin 221, 239–40  
 Bilche–Volytsya zone, Ukraine 322  
 bottom-growth 347, 349  
 brine flows 228–30  
 bromine content 78–9, **81**  
 Carpathian Foredeep Basin 108, 109  
 clastic 249–54  
 cumulate deposition 345  
 deformation and flow 173, 177  
 Dhiban Formation 59, 60, 62  
 diapirs 170, 171, 174, 177  
 dissolution 177  
 facies, Croton basin 171–4  
 fluid inclusions 79–80  
 Great Kavir Basin 72, 73, 75, 76–8  
 La Playa brines 147–8, 152  
 majanna flats 115  
 non-deposition 61  
 Permian Basin 337  
 Poland 277  
 primary 78–9, 268, 322  
 redeposition 249–54, 258–61  
 sedimentary structures 277–9, **278**, 280  
 Ukraine 267  
*see also* rock salt
- halite arenites 253, 254
- halite rudites 253, 254
- Halych, Ukraine, palaeocurrent analysis 223–8
- herringbone calcite 289, 294, 296–301, 303–5
- hexahedrite 268
- high-amplitude bodies 39–41, 43–8
- hinge zone, South Atlantic margin 19, 20, 21
- holomictic pans 112–13
- horst-and-graben structures 70, 248  
*see also* grabens
- horsts 311
- hydrographical model, meromictic basin 219, 230–1
- hydrothermal fluids  
 ‘pseudocarniole’ origin 156, 163, 164–5, 166  
 Ukraine salt domes 309, 313
- industrial deposits  
 potash 265, 323–4  
 rock salt 249, 261
- ionic strength of brines 147, 148, 150
- Iran, Great Kavir Basin 69–85
- Iraq, Kirkuk Basin 53–68
- Irpinia–Daunia Mountains, Italy 191–218, 195
- isochronous deposition 127–30
- isopach analysis 55–6, 59–64, 65
- isotopes  
 carbon 183, 188  
 fractionation 272  
 geochemistry 187, 188  
 oxygen 183, 188  
 stratigraphy 179–90  
 strontium 181, 182–3, 207, 272  
 sulphur 183, 265–73
- Italy  
 Croton basin, Calabria 169–78  
 Monte Castello evaporites 191–218  
 Vena del Gesso evaporites 179–90
- Jeribe Formation, Iraq 65, 66–7
- Jurassic evaporites  
 Berkine/Ghadames Basin 87–105  
 Ukraine 316–18, 328–9
- kainite rocks 266, 267, 268, 323–4
- kainite–langbeinite rocks 266, 323–4
- Kalush–Holyn potash deposit, Ukraine 265–72, 319, 320, 323–4

- karst features 199
  - infill 161–3, 165
  - post-depositional 351–2
  - synsedimentary 351, 352–3
- Kenya, Lake Magadi evaporites 128
- Kerch peninsula (Crimea) 326, 327–8
- kieserite 266, 267, 324
- Kirkuk Basin, Iraq 53–68
  - Burdigalian configuration 55–64
  - Langhian configuration 64–5
- La Playa/La Salina saline systems, Spain
  - 143–53, 144
  - brines 147–8
  - chemical data **145, 146**
  - mineral precipitation sequence 148
  - saturation indexes 147, 149–50, 151
- laminar deposits 6–7
- laminated gypsum
  - Badenian basin 220–1, 237, 240
  - channel structures 134–5
  - Monte Castello evaporites 201–3, 204
- laminites, calcite 287–90
- langbeinite 76, 77, 78, 266, 267, 324
- langbeinite–kainite rocks 266
- Langhian stage 53–68
- Levant continental margin 37–52
- limestones 59, 61, 64, 197, 198–9
  - see also* carbonates
- lithology and environment 9–11
- lithospheric mantle thinning 29
- lithostratigraphy 90, 91, 223–5
- Loeme evaporites 20–5
- lowstand deposits 270–2
- Lukunga Sandstone Formation 19–20
- magnesium sulphates 80, 81–3, 265–73
- majanna-type shoals 111, 135–7
  - depositional environment 115–17
  - gypsum microbialites 133–5
- Malmani Subgroup, South Africa 286
- Mansuriya oilfield, Iraq 63
- mantle thinning 29, 30
- marine deposits
  - Kirkuk Basin 58, 68
  - Miocene evaporites 325, 328
  - Permian Basin 337
  - Zechstein salts 281–3
- marine recharges 188
- marine regression 70
- marine transgressions 66, 99–101
- Marnes Noires Formation 20, 23–4
- mass mineral precipitation 153
- Mediterranean region
  - Levant margin 37–52
  - Lower Evaporites 192, 193
  - Messinian sedimentary cycles 192
  - Messinian Salinity Crisis 191–2
  - regional stages 327
  - Upper Evaporites 192
- Melheh salt pit, Iran 72, 73, 75, **79**, 80
- meromictic basins
  - Badenian evaporite basin 219–46
  - brine accumulation 239–40
  - classification 111–12
  - hydrographical model 230–1
  - mixolimnion 231–6
  - monimolimnion 236–7
- Messinian
  - clastic lobe deposits 37–52
  - Crotone basin, Calabria 169–78
  - evaporites pinch-out 38, 39, 40
  - Monte Castello evaporites 191–218
  - reworked evaporites 10
  - tectonic activity 192, 193
  - Vena del Gesso evaporites 179–90
- Messinian Salinity Crisis (MSC) 37, 48–9, 169, 191–2, 212
- micro-breccias 161
- microbial mats 130, 133
  - calcite 287–90, 300
  - gypsum dissolution surfaces 122–3, 124
- microbialites 304–5
  - architecture 135–7
  - Badenian 118
  - shallow-brine pans 125, 133–5
- Middle Miocene *see* Badenian
- Midland Basin, USA 336
- mineral precipitation sequence 148, 150
- mineralization
  - authigenic, Ukraine 313
  - hydrothermal 309, 313
  - rock salt residues, Ukraine **314**
- mineralogy
  - La Playa/La Salada brines 152
  - Ukraine evaporites 268–9
- Miocene
  - geochronology and biostratigraphy 249
  - Kirkuk Basin 53–68
  - palaeogeography 108
  - stratigraphy 53–4, 320–1
  - see also* Badenian...
- Miocene evaporites
  - active tectonic setting 10
  - Carpathian Foredeep 107–42, 219–46, 265–73, 318–23
  - clastic deposits 37–52
  - East Slovakian Basin 247–64
  - Great Kavir Basin 69–85
  - Ukraine 265–73, 318–28, 329
  - Zbudza Formation 247–64
- mirabilite 148, 150, 152
- mixolimnion (mixed layer)
  - Badenian evaporite basin 231, 235–6
  - brine flows 231
  - meromictic basin model 230–1
  - modern analogues 231–5
  - stratification-mixing pattern 230, 231–6
- models
  - depositional 80–1, 82, 123, 260
  - meromictic selenite basin 219–46
  - Pitzer's model 143
  - salina-type evaporite basin 107–11
- modern analogues
  - Badenian evaporite basin **232–4**, 236
  - mixolimnion 231–5
  - shallow-brine pans 131–3
- Moldova 119, 121, 223

- monimolimnion  
   Badenian evaporite basin 236–7  
   halite 240  
   meromictic basin model 230–1  
   selenite deposition 237  
 monogenetic breccias 159, 160, 163  
 monomictic pans 112–14  
 Monte Castello evaporites 191–218  
 MSC *see* Messinian Salinity Crisis  
 mud flow 261–2  
 mudstones 93, 355
- Na–K–Mg–Cl–SO<sub>4</sub> brines 281, 282–3  
 needle-like gypsum 201, 203  
 Neoproterozoic carbonates 285–308  
   calcite mosaics 296–301  
   diagenesis 301–4, 305  
   evolution 305  
   granular facies 292–6  
   laminites 287–90  
   sedimentary structures 295–9  
 Neogene 325–6  
   *see also* Miocene  
 New Mexico, Permian evaporites 335–64  
 Nile Delta 49  
 nodular ‘fenestrate’ fabric 303–4  
 nodules  
   anhydrite 175, 176  
   calcite 288, 292, 296  
   gypsum 175, 176, 203–5, 296  
 non-deposition, halite 61  
 non-selenite deposition 130–3  
 North Africa, Berkine/Ghadames Basin 87–105  
 nucleation cones 301–2
- oligotrophic pans 133  
 onlap, Messinian 50  
 ophiolitic mélange zones 70, 71  
 organic matter 182, 186  
 orientation  
   brine flows 219–20  
   selenite deposits 224, 225–8  
 oxygen isotopes 183, 188
- palaeocurrent analysis  
   Badenian basin 231  
   Halych, Ukraine 223–8  
   Zolota Lipa, Ukraine 229  
 palaeogeography  
   Badenian evaporite basin 220–2  
   Berkine/Ghadames Basin 98–9, 100–1  
   East Slovakian Basin 248  
   Kerch peninsula 326  
   Mediterranean, Messinian 192  
 palaeokarst features 199  
 Palo Duro Basin, USA 336  
 Paraná basin, Brazil 28–31  
 Paratethys 247–8, 249, 327  
 Permian Basin, USA 335–64  
   depositional history 335–7  
   evaporite cycle types 339  
   fabric criteria 342–56  
     deep water deposition 342–4, 356  
     exposure 350–6  
     shallow water deposition 344–50, 356  
     sediment accumulation rates 341–2  
     water depth determination 337–41  
   Permian evaporites  
     depth indicators 335–64  
     Dnipro–Donets depression 313–15, 328  
     primary sylvite 275–84  
 PHRQPITZ geochemical code program 144, 147  
 pipes, dissolution 351, 352  
 pits, dissolution 351–2, 352–3, 356  
 Pitzer’s model 143  
 playa–lake systems 131–3  
   experimental evaporation 143–54  
   mass mineral precipitation 153
- Poland  
   Badenian evaporite basin 221, 223  
   Badenian gypsum deposits 116, 119, 121, 126  
   primary sylvite generation 275–84  
 polygenetic breccias 159, 161, 162  
 polyhalite  
   Great Kavir Basin 76, 77, 78  
   Ukraine 266, 267, 268, 270, 324  
 polyhalite–anhydrite bed 269–70, 271  
 polymictic pans 112–14  
 Porto Seguro Formation 20  
 post-depositional karst features 351–2  
 post-rift deposition 15, 17–18, 23, 25  
 potash salts  
   Carpathian Foredeep 265–73, 309  
   depositional model 80–1  
   Forecarpathian region 323–5  
   Frasnian, Ukraine 312  
   Great Kavir Basin 72  
   Miocene, Ukraine 319, 320  
   Permian, Ukraine 314–15  
   Poland 277  
   precipitation 272  
   Ukraine 318
- pre-salt sag basins 15–35  
   Barremian to Aptian sediments 31  
   basement morphology and structure 25–31  
   Brazilian margin 17, 18, 19–20  
   capping sequence 20–5  
   depositional packages 19–20  
   depositional space problem 18, 26–8, 31  
   tectonic accommodation 18  
   West African margin 16, 18, 19–20  
   precipitation sequence 148, 150  
   primary halite 78–9, 268, 322  
   primary sylvite 76  
   primary sylvite 275–84  
   proximal sector evaporites 211  
   ‘pseudocarniole’ 155–68  
     chronology 165–6  
     facies and sub-facies 158–63, 166  
     genesis 163–5, 166, 167  
     hydrothermal fluids 156, 164–5, 166  
   pseudomorphs  
     anhydrite 346, 347  
     selenite 292, 301  
   pycnocline 3–5, 228, 231
- recrystallization, halite 173, 177  
 red algae 57, 58–9

- Red Formation, Iran 70–3  
 red siliciclastic mudstones 355  
 redeposition 347  
   gypsum 205, 206, 207, 209  
   halite 249–54, 258–61  
 regional tectonic control 212, 213  
 relative humidity (RH) 3, 24  
 replacement, gypsum 305  
 residual facies, Crotone basin 174–6  
 residual pseudocarniole 159–61, 166  
 reworked evaporites 5–6, 7, 10  
   *see also* redeposition  
 RH *see* relative humidity  
 rifting  
   deformed evaporites 9, 10  
   evaporite deposition 80–1  
   Great Kavir Basin 69–85  
   pre-salt sag basins 18–19, 31  
   Saharan evaporite basin 101–3  
   syn/post-rift deposition 15, 17–18, 23, 25, 32  
 rock salt  
   Bilche–Volytsya zone, Ukraine 320–3  
   geochemistry, Zbudza Formation 256  
   mining 318  
   Transcarpathian trough 326  
   Ukraine 312–13, 314, 317  
   *see also* halite  
 Romagna Apennines 179–90  
 rose diagrams, selenite orientation 226–7, 228
- sabkha-type evaporites 96  
 Saharan evaporite basin 99–103  
 Saharan Platform, North Africa 87–105  
 Salado Formation, USA 359–60  
 salina-type evaporite basin 107–42  
   deep-brine pans 120–4  
   definition 108–9  
   lithosomes 117–18  
   main features 109–11  
   majanna-type shoals 111, 115–17  
   saline pans classification 111–15  
   shallow-brine pans 124–37  
   stratification-mixing cycles 112–14  
   water-level fluctuations 110, 120–2, 123  
   *see also* Badenian gypsum facies  
 saline clays 319  
 saline pans  
   hydrographical classification 111–15  
   selenite deposition 112–15  
   stratification-mixing cycles 112–14  
 salinity 3–5  
   *see also* pycnocline  
 salt domes *see* diapirs  
 Santos Basin, Brazil 20, 28–31  
   depo-centre thickening 24  
   seismic reflection profiles 21–3  
 saturation indexes, La Playa/La Salada brines 147,  
   149–50, 151  
 saturation shelf concept 238  
 SCC *see* sedimentary chaotic complex  
 sea-level position 49–50  
 seafloor spreading, South Atlantic 18, 20–3, 25  
 seawater evolution 309–10  
 sediment accumulation rates 2–3, 341–2  
 sedimentary chaotic complex (SCC) 169  
 sedimentary structures  
   calcite 285–308  
   cauliflower structures 292, 301  
   enterolithic structures 255–9  
   halite 277–9, 278, 280  
   herringbone structure 289, 294, 296–301, 303–5  
   selenite 124  
   Zbudza Formation 252  
 sedimentology, Zbudza Formation 247–64  
 seismic control 7, 260–1  
 seismic data  
   Berkine/Ghadames Basin 88–90  
   clastic lobe deposits 38–42  
   interpretation 42–6  
   ribbon-shaped bodies 41–2, 43, 46, 48  
 seismic geomorphology techniques 37–52  
 seismic stratigraphy 91–3, 94–5  
 selenite  
   crystal aggregates 294  
   pseudomorphs 292, 301  
 selenite deposition  
   cycles 212  
   meromictic basin 219–46  
   mixolimnion 237  
   orientation 224, 225–8  
   below pycnocline 114, 120–2, 123, 127, 129  
   rose diagrams 226–7, 228  
   saline pans 112–15  
 selenite facies 4, 118–37  
   architecture 135–7  
   coarse-crystalline 114, 118–24  
   dissolution surfaces 118–24, 122  
   environmental interpretation 121  
   grass-like 124–7  
   marker beds 129  
   stratigraphic relations 119  
 selenitic gypsum 200–1, 202  
 sequence stratigraphy 96–8  
 Serikagni Formation, Iraq 55–9  
 shallow-brine flat-bottomed pans  
   channel structures 133–5  
   depositional model 123  
   grass-like selenite facies 124–7  
   isochronous deposition 127–30  
   marker beds 129  
   microbialite deposition 133–5  
   modern analogs 131–3  
   non-selenite deposition 130–3  
   tectonic control 137  
 shallow salina-type evaporite basin 107–42  
   saline pans 111–15  
   selenite facies 118–37  
 shallow water  
 evaporites 7, 8  
 fabric criteria 344–50  
 shelf settings, Permian Basin 338  
 shoals *see* majanna-type shoals  
 Sialivakou Formation 19  
 siliciclastic deposits  
   constructional clastic body 44–5  
   depth indicators 341–2  
   Great Kavir Basin 73, 78  
   Levant margin 37, 39–40

- siliciclastic deposits (*Continued*)  
   Permian Basin 337  
   red mudstones 355  
   Zbudza Formation 254–6, 261  
 slope slides, clastic halite 254–6, 261  
 Slovakia *see* East Slovakian Basin  
 sodium sulphate salts 153  
 soft-sediment deformation processes 304–5  
 South Africa, vanished evaporites 285–308  
 South Atlantic pre-salt sag basins 15–35  
 Southeastern Brazilian highlands 28–31  
 Southern Apennines  
   fold-and-thrust belt 194  
   Irpinia–Daunia sector 194, 195  
   Monte Castello evaporites 191–218  
 space problem, evaporite deposition 18, 26–8, 31  
 Spain, natural playa–lake systems 143–54  
 Stebnyk potash deposit, Ukraine 265–72, 268, 270, 271, 323–4  
 stratification-mixing cycles 219  
   deep-brine pans 120–2  
   mixolimnion 230, 231–6  
   saline pans 112–14  
 stratified brines 3–5, 230–1  
 stratigraphy  
   Badenian gypsum facies 240–1  
   Berkine/Ghadames Basin 90–3, 94–5, 96–8  
   Great Kavir Basin 69–74  
   isotopes 179–90  
   Miocene 53–4, 249, 320–1  
   Monte Castello evaporites 196–200, 207–9  
   Neoarchaeal carbonates 286  
   Saharan evaporite basin 102  
   seismic 91–3, 94–5  
   Zechstein 279  
 stromatoclasts 288, 294, 300  
 stromatolites 8, 290–1, 294  
 strontium  
   geochemistry 205–7  
   isotope ratios 181, 182–3, 207  
 structure  
   Iraq 54–5  
   Western Alps 156  
 subaerial exposure 48, 355–6  
 subaqueous fans 261  
 submarine channel-mouth lobes 49–50  
 subsidence, salina-type basin 137  
 subterranean karst infill 161–3, 165  
 sulphates  
   Bilche–Volytsya zone, Ukraine 320–2  
   brines, Ukraine 270  
   Great Kavir Basin 78  
   lowstand deposits 270–2  
   magnesium 80, 81–3, 265–73  
   sodium 153  
   sulphur isotopic composition 265–73  
   Ukraine 312, 317  
   Zbudza Formation 254–6  
   *see also* anhydrite; gypsum; selenite  
 sulphur isotopic composition  
   materials sampling 269  
   methods 269–70  
   polyhalite–anhydrite bed **271**  
   sulphates, Ukraine 265–73  
   Vena del Gesso evaporites 182, 183  
   Susa Valley, ‘pseudocarniole’ 155–68  
   swirl flow pattern 228  
   sylvinite 76–7  
   sylvite  
     fluid inclusions 79–80, 277–83  
     Great Kavir Basin 76–8  
     homogenization temperatures 281  
     primary 275–84  
     Ukraine 266, 267, 268, 324  
   syn-rift deposition 15, 17–18, 25, 32  
   syn-rift faulting 23  
   syndimentary karst features 351, 352–3  
 tachyhydrite 83  
 TAG-I *see* Triassic Argilo-Greseux Inferieur  
 tectonic activity  
   deposition styles 5–6  
   evaporite deposition 80–1  
   facies diversity 7–9  
   Kirkuk Basin 61, 66–8  
   Messinian 192, 193  
   passive basins 5–7, 8, 10  
 tectonic control  
   halite redeposition 259–61  
   Monte Castello evaporites 212, 213  
   pre-salt sag basin accommodation 18  
   salina-type basin deposition 137  
 tectonic pseudocarniole 163, 165  
 thenardite 147–8, 150, 152  
 thermal plume, South Atlantic 29, 30  
 thermal subsidence 32  
 thick-bedded selenite facies 114, 118–24  
 thin-bedded selenite facies 124–7  
 thinned continental crust 25–7  
 tholeiitic basalts 29, 30  
 timing, pre-salt sag basins 15–35  
 topography  
   Permian Basin 338–41  
   Walvis Ridge 24–5, 28–31  
 Toppo Capuana Formation 194, 196  
 Torrente Fiumarella unit 194, 196  
 Tortonian, reworked evaporites 10  
 Transcarpathian trough, Ukraine 325–6  
 transgressive lag deposits 22  
 travertine 163, 164, 166  
 Trias Carbonaté 99–101  
 Triassic Argilo-Greseux Inferieur (TAG-I) 88, 99  
 Triassic, ‘pseudocarniole’ 156, 157  
 Triassic–Jurassic evaporites, Berkine/Ghadames Basin 87–105  
 Tristan da Cunha plume 29, 30  
 Tunisia, Berkine/Ghadames Basin 87–105  
 turbidites, gypsum 10  
 Ukraine, palaeocurrent analysis 229  
 Ukraine evaporites 309–34  
   Badenian basin 219–46, 221–2  
   Badenian gypsum deposits 116, 119, 121, 126, 129  
   Bilche–Volytsya zone 320–3  
   Carpathian Foredeep 265–73, 318–20  
   Devonian 312–15  
   Dnipro–Donets depression 310–15



- Forecarpathian region 317
- Foredobrogean trough 317–18
- Jurassic 316–18
- Kerch peninsula (Crimea) 327–8
- Miocene 265–73, 318–28
- origin 315, 325, 328
- palaeocurrent analysis 225–8
- Permian 313–15
- sulphur isotopic composition 265–73
- United States, Permian basin 335–64
  
- vadose fabrics 351–2
- vanished evaporites 285–308
- Vena del Gesso evaporites 179–90
  - facies description **181**
  - isotope geochemistry 187, 188
  - isotope stratigraphy 179, 181–8
  - lithology and isotope data **184–5**
  - organic matter 182, 186
- volcaniclastic layers 195, 196
- Vorotyshcha potash suite, Ukraine 266, 268, 320
- vuggy carbonate rocks 155–68
  - see also* ‘pseudocarniole’
  
- Walvis ridge 24–5, 28–31
- water depth determination
  - accumulation rates 341–2
  - fabric criteria 342–56
  - methods 337–41
  
- water-level fluctuations
  - playa lakes 131–3
  - salina-type basins 109–11, 120–2, 123
  - shallow-brine pans 130
  - tectonic control 137
  - see also* drawdown
- water-table evaporites 350–2, 354
- water transport, detrital pseudocarniole 161–3
- wave-reworked fabrics 347
- weld rocks 174, 175–6
- West African margin, pre-salt
  - deposits 19–20, 21
- West Texas, Permian evaporites 335–64
- Western Alps, ‘pseudocarniole’ 155–68
- white halite facies 171, 172, 173
- Wieliczka salt mine 259, 261
- wireline log data 90, 94
  
- Zbudza Formation 247–64
  - borehole lithology profiles 251
  - cyclicality 254–6, 261
  - genesis 258–61
  - geochemistry 256–7, 262
  - lithology and facies 249–54, 261
  - locations 250
  - sedimentary structures 252
- Zechstein evaporites 275–84
  - halite inclusions 277–9
  - marine origin 281–3
  - stratigraphy 279