

Index

Page numbers in *italic* denote figures. Page numbers in **bold** denote tables.

- abandonment of faults 343, *361*, 362
- accretion 2, 5, 69, 467
 - of new blocks 465, 468
- accretionary prism 257–258
 - active recently 466
 - exhumation 445, 447
 - inversion 458
 - shortening data **196–197**
 - Tien Shan 21, 22, 36, 39
- active tectonics and inversion 193
- AFT *see* apatite fission track
- Agua Caliente structures 48, 49, 56
- AHe *see* apatite-helium data
- Aktau–Junggar microcontinent 21, 22
- Alemania–Pampa Juntas–Acosta structures 88–94, 95
- Alpine movement 121, 125, 131–134, 135
- Altaid accretionary collage 36, 39
- Altiplano–Puna Plateau, drainage basin 405, 406
- Amblayo–Ayuso structure 82–83
- Andean compression 271
- Andean deformation 77, 81, 96, 97
 - Cordillera Oriental 101–104, 106, 111, 113–114
- Andean fold and thrust belt 190
- Andes, central, foreland basin 101–114
- Andes, central structure 78
- anisotropy, pre-existing 2, **11**, 14, 467
- anisotropy, basement 77, 95, 96, 97
 - see also* inherited anisotropy
- apatite 290, 299, 304, 308
- apatite fission track age 109, 414, 427, 428,
432, 434, 438
 - Eastern Cordillera 147, 151, **416–417**
 - High Atlas 144
 - Magdalena Valley 346, *347*, 349–357, 362
 - Nuevo Mundo 317, 319–321, 325, 335, 337, 339
 - Pyrenees 149
- apatite fission track analysis 48, 62, 70
- apatite fission track data *212, 214, 235, 242, 244*
 - use in drainage study 369, 371, 386, 395, *396, 399,*
401, 403
 - exhumation history 207, 238, 239, 245, 444–448
 - sample data **211, 236, 320–321, 350–352, 384–387,**
416–417
- apatite helium data **240**, 245, 438
 - Nuevo Mundo 317, 319, **322**, 325, 335, 339
- apatite (U–Th)/He dating 317, 414
 - Llanos foreland 445–448
 - Magdalena Valley 346, 355
- Apennines, extruded domain 135
- Apulia, plate flexure *184, 186*
- Argentina, basin fragmentation 101–114
- Argentina, Cordillera Oriental 77–98
 - Astur–Galaico boundary 130
 - Atlantic Ocean, opening 62, 69
 - north 120
 - southern 102
 - Atlantic, sea-floor spreading 457
 - Atlas Mountains thrust-fold belt 141, *142*
 - deformation 143–145
 - back-arc 162
 - back-arc rift basin 102
 - balanced cross-section 13
 - Cordillera Oriental 82
 - Eastern Cordillera 8, 429–431
 - Llanos foothills 190, 193, 197–201, *202–204*
 - Magdalena foothill belt 223
 - basal décollement and pillows 52–53, *54*
 - basal detachment 278–279
 - basement anisotropy, Cordillera Oriental 77, 95, 96, 97
 - basement dip and structural style 250–252
 - basement fault, shortening 33
 - basement fold, Tien Shan 27, 29
 - basement geology, Eastern Cordillera 418, 419
 - basement rocks 449
 - basement structures, reactivation 33–34, 38
 - basement uplift, NW Argentina 101, 104–110, 113
 - basin configuration, Magdalena Valley 348–349
 - basin fragmentation, NW Argentina
 - stratigraphy 104, 105, *106*, 109–111
 - structure 106–114
 - tectonic setting 101–104
 - basin geometry and reactivation 286, *305*
 - Basque–Cantabrian Pyrenees 120–123, 130
 - thin-skin structures 134–135
 - Bay of Biscay, plate tectonics 120, 122
 - borehole breakout 268, *269–270, 271*
 - Bouguer anomaly map 228
 - box fold *30, 277*
 - Boyacá fault 264, 266, 267, 274, 310, 422
 - recent activity 466
 - break-back episode 101
 - brittle fold 277
 - broken foreland 113
 - buckle fold *272–275, 277, 278, 279*
 - buoyancy 458–459, 467, 468–469
 - burial depth 46, 47, 48, 56
 - burial temperatures 356
 - buried thrust belt, deformation timing 344, 346, 363
 - buttress 201–205
 - basement 467, 468
 - buttressing 2, 9, **11**, 14, 113, 114, 247
 - bypass structure 91
 - Magdalena 247–250, 251

- Cabuérniga Fault 123, 130, 131, 133,
 Cantabrian Mountains 130–132, 134, 135
 Capiron–Tiputini Inverted System 67, 68
 Capiron–Tiputini play 72
 Caribbean Plate, collision 412
 Caribbean Plate, subduction 268, 269
 Caribbean tectonics 444
 case study, area selection 7–9
 Caspian region 160–161
 Castilla–Chichimene province, seismic interpretation
 452–461
 Caucasus orogenic systems 160–165, 183
 Central Cordillera 412
 Cerro Negro Thrust 85, 86, 87, 88
 Charyn Canyon thrust fault 27, 31, 33, 34
 climate 151
 climate and inversion tectonics 286
 climate forcing 438
 Cobares anticline, provenance 391–392
 collision 412
 Eastern Cordillera 448
 Eurasia and Arabia 182
 India–Asia 20
 Colombia
 Eastern Cordillera
 drainage development 149–153, 369–407
 graben 221, 222–223, 257–279, 316
 inversion tectonics 411–469
 tectonostratigraphy 285–310
 thrust-fold belt 141–147
 Llanos foothills, thrust belt 189–218, 223, 230–231
 Middle Magdalena Valley 230–231, 315–340
 compartmentalization and drainage 369, 397–404
 convergence 457, 458, 466
 maturity 469
 oblique 455, 467, 468
 rate of 19, 431, 439, 464–465
 converging plates
 Caribbean–South American 286
 Georgia 159–186
 Cordillera Oriental, thick-skin inversion 77–98, 101
 basement anisotropy 77, 95, 96, 97
 cross-sections 80, 82–83, 86, 89
 stratigraphy 79–81
 structure 82–94
 Cosos plate, convergence 464
 cross-sections
 Alps, western 6
 Caucasus orogen 161, 183
 Colombian thrust-belt 198–204, 208–210,
 212–214
 Cordillera Oriental 80, 82, 83, 86, 89
 Eastern Cordillera 145, 260, 265, 271–274, 276, 278,
 287, 306, 347, 435–437
 Garzón Massif 437
 High Atlas 145
 Llanos foothills 192, 198–204, 208–210, 212–215
 Magdalena 223, 430–431
 Middle Magdalena 226, 232, 234, 237, 239, 241–242,
 248–249
 Nuevo Mundo 260, 338
 Opón structures 435
 Oriente Basin 64
 Pyrenees 120, 132, 148
 rifting 361
 Río Horta syncline 237
 Santander Massif (Colombia) 260, 272, 287, 336
 seismostratigraphic 104, 105, 106–109, 110
 Tien Shan 22, 26
 Tucumán Basin 108
 Ucayali Basin 46
 Venezuela foothills 192
 crust 2–3
 northern Spain 121
 crustal thickening 5, 151, 468–469
 crustal thickness 2, 145
 crustal thinning 148

 décollement 43, 48–49, 135, 154, 162, 163
 experimental model 49–55
 deformation front
 Eastern Cordillera 401, 405, 412, 422, 423
 Llanos foothills 190, 193, 205, 207, 212–213, 217–218
 Magdalena foothills 225, 252
 deformation history 1–2
 deformation, controlling factors 9, 10, 11
 deformation, rate of 405, 406
 deformation, timing 11, 13–14
 buried thrust belt 344, 346
 denudation 358, 393
 rate of 438
 thrust induced 346
 depocentre 453, 454, 461–463
 Eastern Cordillera 386, 397, 405–406
 depocentre, formation 250
 depocentre, tectonic fragmentation 286, 304–307
 depositional environment 360
 and inversion 286, 288–290, 305
 Nuevo Mundo 323, 334, 335
 Tien Shan 23
 detachment horizon 2, 3, 9, 11, 14, 468
 detachment linkage 215, 217
 diapir, deformation of 44, 49, 53, 55
 displacement v length ratio 213–214, 215, 216
 drainage basin, internal 360, 362, 363, 364
 drainage evolution 286, 392, 404–406
 in inverted rifts 141, 149–154
 drainage evolution and inversion (Eastern Cordillera)
 369–406
 compartmentalization 397–404
 drainage patterns 404–406
 stratigraphy 372
 study methods 372, 386, 387
 tectonic setting 371
 thermochronology 394–397, 398
 U–Pb source area 387, 390–394

- Duero Frontal Thrust 130, 132, 133
dynamic setting, categories 2–7
- earthquake 109
 Oriente Basin 62
- earthquake data and topography 450–451, 467
- earthquake focal mechanism 35, 36, 268
 Andes, northern 412, 444, 448, 452, 457, 465, 466
 Eurasia 166, 171, 185
- earthquake hypocentre 8
- Eastern Cordillera 9–14, 221, 222–223
 drainage and rift inversion 369–406
 drainage development 149–153
 exhumation history 443–448, 460, 466–469
 fault segmentation 190–218
 graben development 257–279
 stratigraphy 230, 289
 correlation 291, 295, 299
 thrust-fold belt 141, 143, 145–147
- Eastern Cordillera, shortening and sedimentation 411
 discussion 430–439
 results 419–430
 study methods 414–415, 419
 tectonic setting 412–414
- Eastern Cordillera, tectonostratigraphy 285–310
 comparison of models 309–310
 depositional environment 288–290
 domains 287
 regional setting 286–288
 stratigraphy 289
 study methods 290–291
 thickness variation 291, **293–294, 296–298**
- Ecopetrol SA 258, 386, 412
- ECOPETROL–ICP, Barichara conference 2
- Ecuador, Oriente foreland basin 59–73
- energy balance 7, **11**, 467, 468
- erosion 173, 343, 358, 404, 467
 Central Cordillera 344
 High Atlas 151, 152, 154
 Magdalena Valley 343–344, 363
 Oriente Basin 62–63
 Upper Magdalena Valley 403
- erosion and denudation 438–439
- erosion and palaeothermometry 48
- erosion window 326
- erosion, rate of 468
- erosion, syntectonic 2, **10, 11**, 343–344, 363
- erosional unconformity
 Georgia 180–181, 182–186
- European crust 2–3
- evaporites 121, 123, 124, 126, 135
- evaporites and thrusts 43–44, 47
- exhumation 154, 210, 267
 age 109
 Central Cordillera 349, 361
 Middle Magdalena 238, 245, 249, 250, 335, 337
 Oriente Basin 62–63
 rate of 467
- exhumation, Eastern Cordillera 309–310, 356–357,
 Cenozoic 419, 422–428, 431, 433, 438
 history 443–448, 460, 466–469
 rift inversion 369, 371, 397, 400–405
- experiment, deformation localization 49–56
- exploration targets 55–56
- extensional fault
 Argentina 107, 112, 111, 114
 Oriental 88, 90, 93, 95–97
 Atlas Mountains 146
 Eastern Cordillera 262, 264–266, 269
 Pyrenees 124, 127, 130
- extruded domain 121, 134, 135
- facies 326, 329, 339, 340
- fault
 displacement profile 189–190, 193, 197–201
 flexural 229, 250, 340, 433
 growth mechanism 190
 normal *see under* normal
 propagation experiment 52–56
 see also inverted, reverse, strike-slip, thrusts
- fault segmentation and growth 189–218
 method of study 193
 previous study/tectonic setting 190–193
 results/discussion 193–218
- fault types 214
- fault-bend folding 272–275, 277
- fault-propagation folding 272–275
- faults, Eastern Cordillera 446
 reactivation 285–310
- flexural basin 307
- flexural normal fault 229, 250, 433
 reactivation 340
- flexure 165, 173, 183, 185
 foreland plate 449, 453, 458–460, 467, 468
- Floresta Massif 260, 264, 396
 basement 258, 414, 419
 contraction/reactivation 266, 267, 268
 exhumation 401, 424, 445
 provenance 391
 stratigraphy 230–231, 373, 415
- flower structure 28, 31
- fluid pressure 363
- fold classification, Eastern Cordillera 278
- fold style 272–275
- foothill thrust belt/inverted graben 189–218, 223
- forceful scenario 7
- forebulge 467
- foreland basin deposits
 Andes, central 104–105, 110–112, 114
 High Atlas 144–145
 Kura 169–171, 177–179
 sediment thickness 168–173
- foreland basin flexure 165, 185, 186
- foreland basins, central Andes 101, 104–105, 110–114

- foreland interactions, N Andes 443–469
 data 453–454
 discussion 464–468
 interpretation 454–464
 study method 448–452
- foreland plate and converging orogens (Georgia)
 159–186
 interpretation 179–185
 results 168–173
 stress orientation 175–177
 study methods 165, 167–168
- forward-breaking sequence 411
- friction and cohesion 343, 363
- friction angle 43
- frictional coefficient 275
- frontal thrust 453
- garnet 290, 299, 301, 302, 304, 308, 310
- Garzón massif 258, 259
 cross-section 437
- geometry
 and facies 340
 and inversion 77–98, 257–258, 262, 275
 geometry and structural style
 Llanos 193–201
 Magdalena 227–235, 250–252
- graben and inversion 221–252
- Georgia, Kura Valley 159–186
- glauconite 299, 300, 301, 304, 307, 335, 419
- Golobar Fault 125, 129, 130
- Gondwana 102
- GPS velocities 35, 36
- graben 146, 316
- graben development and structural style
 (Eastern Cordillera) 257–279
 basement influence 258–262, 275–279
 fold style 272–275
 inversion tectonics 266–268
 pre-compression basin 262–266, 271
 shortening estimate 271–272
 stress/palaeostress 258, 268–271
 study methods 258
- grain composition 244
- grain size 104, 340
- gravimetric map 228
- gravity resistance 468
- Greater Caucasus Basin 162
 sedimentation 179–180, 185
 orogenic system 163, 173
- growth fault 55
- growth strata 147, 151, 245, 429
- Guaduas syncline 233–235, 236, 239, 241,
 247, 250
 age 245, 356, 357, 358
 exhumation 249
 provenance 391–392, 395
- Guaicaramo Fault 198, 200–209, 215, 224
- gypsum 104, 168, 332, 362
- half-graben, inverted 68, 90, 93, 111
- hard linkage 215, 437
- headward erosion 151, 152, 154
- heat flow 185
- heavy minerals 290, 299, 304, 307, 308,
 310, 419
 photomicrographs 295, 301
- heavy oil 64, 72
- High Atlas thrust-fold belt 142–145
 drainage development 149–153
 structural comparison 279
- hinterland loading 340
- hydrocarbon 71, 369
- hydrocarbon traps and deformation 55–56
- Ili Basin 23–36
- imbricated conglomerate 326
- indenter model 413, 433
- India–Asia collision zone 20
- inherited anisotropy 77, 113, 119, 371, 406, 411
- inherited drainage 141
- inherited fault systems 433
- inherited strength 467
- inherited structure 47, 217
 and deformation style 119–136
 and inversion 257, 276–277, 315
 Oriente Basin 64, 96
- Inter-Andean Depression 60, 61
- intermontane basin, sedimentation and tectonics
 315–340
- internal drainage basin 402, 405–406
- intra-cratonic rift system 1
- intra-plate setting 2, 7
- inversion
 Argentina 102, 106, 107, 111, 112, 114
 Cordillera Oriental 96, 97
 Oriente foreland 63, 67–70
- inversion linkage 217
- inversion tectonics, Eastern Cordillera 266–268
- inversion timing 353–354
- inversion, characterization 2
- inversion, first signs 444
- inversion, sedimentation and shortening rates
 deformation 419
 erosion and denudation 438–439
 exhumation 422–423, 424, 426–428
 mechanical properties 433, 437
 plate tectonics 412, 430–431, 433
 sedimentation rate 421–422, 423, 424, 428
 shortening rate 429–431, 433, 437, 438
 study methods 414–415, 419
 tectonic acceleration 423, 426–429
 tectonic quiescence 419, 421–422
 tectonic setting 412–414
- inversion/accretion, case study/area selection 7–9
- inverted graben/foothill thrust belts 189–218, 223
- inverted faults 201–205
 normal 262, 266, 273, 400–402, 413, 458

- Ionian Zone, shortening 186
 isopach maps 386, 399, 452, 462–466
 Kura Valley 177, 178–179
 Llanos foothills 210, 212, 216
 isostatic rebound 62, 63
- Katatau–Duyantau piedmont 25, 28–32, 35
 Kazakhstan, inheritance and deformation 19–40
 kinematic restoration
 Eastern Cordillera 414, 430–431, 435–437
 intermontane basin 319, 335–339
 inverted graben 235, 242, 248–249
 kinematics of deformation
 Tien Shan 32–33
 Ucayali Basin 48–49
 Kura Valley, Georgia 159–186
 sediment palaeodispersal 178–179
 sediment thickness 168–173, 177–178
 structure 160–165, 173–175
 Kuturgai Thrust Fault 31
- La Pas, age 244
 La Salina Fault 235, 362
 active recently 466
 exhumation 447
 inversion 458
 Late Cretaceous–Cenozoic unconformity 346,
 348–349, 361
 length and displacement 213–214, 215, 216, 362
 Lesser Caucasus orogenic system 163
 Lisama/Nuevo Mundo structures 227, 232
 age 244
 lithofacies interpretation, Nuevo Mundo 323
 Llanos Basin 370, 430, 433
 age 394
 fault reactivation 208, 286, 288, 306, 310
 Palaeocene deformation 419, 420
 seismic profile 421
 stratigraphy 231, 373, 386, 415
 Llanos foothills
 passive roof duplex 340
 stratigraphy 230–231
 Llanos foothills, thrust belt 189–218, 223
 geometry and structure 193–201
 inversion faults 201–205
 isopach maps 210–212, 216
 shortening and displacement 195–197, 201, 205–207,
 212–217
 tectonic setting 190–193
 timing of movement 207, 210, 217–218
 Llanos foreland basin 443–469
 exhumation history 443–448
 fill 452, 453
 overflow 467
 seismostratigraphy 449–454
 stratigraphy 447
 loading, orogenic 467, 468
 location of study areas 12–13, 20
 longitudinal drainage 150, 151, 152–154, 179
 Los Cobardes anticline, thermochronology 319–321
- Macas (1995) earthquake 65, 66
 Magdalena Basin, fault reactivation 286
 Magdalena Valley, abandonment/reactivation case study
 343–364
 basin configuration 348–349
 friction and cohesion 343, 363
 geology 344–346
 inversion timing 353–354
 sediment dispersal 357–362
 stress orientation 343, 346, 362–363
 study methods 346–348
 thermochronology 349, 353, 354–359, 361
 uplift timing 349, 356–357, 359
 Magdalena Valley, thrust belt 413
 sedimentation 422, 424
 magmatism 63, 288
 interplate 306, 310
 mammal (fossil) 23
 mantle 148
 mantle flow 2, 3, 4, 5, 6
 Marañon–Oriente–Putumayo oil province 59, 60, 72–73
 Marañon–Oriente–Putumayo, erosion surface 67
 maturation 46, 47, 70, 71
 mechanical properties 433, 437
 mechanical weakness, Tien Shan 36
 mechanism, fault reactivation 344
 Mesas region, thermochronology 319–321
 Meta river 468
 drainage analogue 397
 microcontinent 21, 22
 mid-Atlantic sea-floor spreading rate 457
 Middle Magdalena foothill belt 221–252, 259, 261,
 263, 270–271
 chronostratigraphy 230–231, 318, 373, 415
 comparison 223, 247–250
 deformation chronology 235–245
 geological setting 223–225, 226
 geometric aspects 227–235, 245, 247
 stratigraphy 230–231
 structural style 250–252
 study methods 223
 Middle Magdalena Valley 315–340, 370, 419
 migration pathway 71, 73
 mineral age 293–294
 Mohr–Coulomb failure 275, 277
 mountain building 461–467, 469
- nappes, basement 3, 5
 National Earthquake Catalogue of Columbia 448
 Nazca Plate 456, 464
 collision 412
 reconstruction 438
 subduction 60, 103, 113, 268
 Nazca Ridge, subduction 45, 46
 Neotethys subduction 160

- normal fault *131*
 inversion 201–205, 217
 reactivation 308, 343
- North Calchaquí Valley structures *84, 85–88*
- Nuevo Mundo syncline 227, 232, 316
- Nuevo Mundo syncline, facies and tectonics 315
 age 235, 357, 394
 cross-section *260, 338*
 faults 247, 248, 250
 kinematic restoration 319, 335–339
 lithofacies **323**
 previous study 319
 provenance *391–393, 395, 422*
 analysis 318–319, **324**
 sediment dispersal 360
 sedimentology 318, 321, 324–335
 study methods 316–319
 tectonics and sedimentation 339–340
 thermochronology 317–321, 325, 335
- oil field
 Opón 227
 Oriente Basin *61, 64–67, 70–72*
 Provincia *428*
- oil prospects and folding 274
- oil seeps, Kura Valley *164, 165, 173*
- oil trap 193
- Oña Anticline *126, 133*
- Opón structures 227, 229, 233–234, 260
 age 354, 357, 358
 cross-section *435*
 deformation *244, 249, 271*
 exhumation 238, 250
 sediment dispersal 360
- Oriente foreland basin, thick-skin tectonics 59–73
 inversion and timing 67–70, 73
 location *60*
 petroleum systems 70–72
 stratigraphy 62–64
 structural analysis 63, 64–67
 tectonic setting 60–62
- Oriente, structural domains
 Capiron–Tiputini Inverted System 67
 Sacha–Shushufindi corridor 65–67
 sub-Andean fold and thrust belt 64–65
- oroclinal bending 405, 406, 433
- orogenic setting, category 2–7
- overturned limbs 275–276
- palaeocurrent 147, 168, 288
- palaeoenvironment 63
- palaeoflora 147
- palaeoflow 324, 337, 360
 Magdalena 241, 245, 246
 Nuevo Mundo 318, 326, 328, 331, 333–335, 339
- palaeogeography 387, 400–402
 Cordillera Oriental *91–94*
 Eastern Cordillera *420, 425*
- palaeorelief *126*
- palaeosol 329, 333
- palaeostress 258, 268–271, 455
 orientation 175–177
- palaeotemperature 277
- Palaeotethys subduction 160
- palaeothermometrical data 346–347, **353**
- palaeothermometry 46
- palynology 289, 290–294, 295, 299
- Pampa Juntas structures 88–94, 95
- Pamplona Transfer Fault *121, 123*
- Panamá–Baudó indentation 412
- Pangaea 62
- Partial Annealing Zone 320, 325, 349
- Pas structures 123, 124, *126, 127, 133*
- passive margin setting 1
- passive roof duplex 229, 231, 245, 251, 340, 438
- pebble imbrication 168, *172, 178–179*
- pebbles and styloliths 167
- Peru, Ucayali Basin 43–56
- petrography 318, 329, 333, 334, 339
 analysis **324, 327**
- petroleum systems Oriente Basin 59, 70–72
- plate tectonics 412, 430–431, 433, 439
- pollen 308
- Pontides, shortening 164–165
- pop-up range 27
- pop-up structure 52, 54, 55, 108, 111
- pore pressure 363
- post-rift sediments
 Argentina, NW 104, 114
 Cordillera Oriental *81, 84, 85, 88, 90, 93, 96*
 Eastern Cordillera 146
 Pyrenees 123, 148
- pressure solution 167, 168
- protoliths 258–262
- provenance 179, 299–310, 317–340
 Central Cordillera 349, 371, *391–395, 397, 399, 403*
 Eastern Cordillera 147, 400–404, 419, 425, 429
 High Atlas 144
 Magdalena Valley 347
 Nuevo Mundo 338, 339, 422
 Pyrenees 153, 154
- provenance analysis 290, 299–304, 307, 318–319
- provenance signature and inversion 286
- Provincia oil field *428*
- Pucará–Vallecito structure 83, 85
- pure compression 265, 268, 269–271, 275, 276
- Pyrenean Orogen, thin- to thick-skin transition 119–136
 faults and structures 124–136
 stratigraphy 123–124
 tectonic setting 121–123
- Pyrenees thrust-fold belt 141, *144, 145, 147–149*
 drainage development 149–153
- pyroxene 290, 299, *301, 304*

- Quetame massif 258, 260, 262, 288
 basement 414, 419
 stratigraphy 230–231
- rate of movement 9
- reactivation 56, 467
 basement structures 33–35, 38
 Magdalena Valley 343, 363
- restoration sections, Eastern Cordillera 271, 272, 274
- restoration, kinematic 414, 415, 429, 430–431, 435–437
- retro-arc foreland 316
- retro-arc foreland basin 223
 Oriente 59, 60, 62, 63, 69, 72
- retrodeformation 336
- retro-wedge setting 2, 3, 5, 10, 164, 443
 Tien Shan foreland 19
- reverse fault 413, 414
 inversion 399–402
 Magdalena 232, 234, 263
 Tien Shan 36–39
- reverse slip 343
- rheological layering 51
- rheology 2, 10
- rift basin anisotropy 257
- rift basins 153
 Eastern Cordillera 146
 Pyrenees 148
- rift inversion 59, 141
- rift inversion and drainage 369–406
- rift system 361
- Río Horta syncline 231–233, 260, 270, 272
 apatite fission track data 235, 236
 cross-section 237
 deformation timing 239, 249
 faults 247, 250
 palaeocurrent 246
- rivers, transverse 150, 153–154
- rollover anticline 83
- Sacha Profundo, seismic section 66, 67
- Sacha–Shushufindi corridor 65–67, 69
- Sacha–Shushufindi play 65, 72
- sag basin 45, 306, 309
- salt diapir 142, 146, 148–149
- salt pillows, case study 43–56
 experiment set up 49
 modelling 50–51
 results 51–55
- salt, deformation 7, 8
- Salta Basin 78, 95–96, 97
- Salta Rift 102, 103, 104, 111–114
- Santa Bárbara system 101, 102, 110
- Santa Bárbara Thrust 89, 90, 91
- Santander Massif (Colombia) 266
 basement 258, 305
 chronostratigraphy 318
 cross-section 260, 272, 287, 336
 erosion 394
 exhumation 319, 320–321, 334, 338, 339
 provenance 391–393, 395
 syn-rift deposits 419
 uplift 362
- Santander Transfer Zone (Spain) 121, 136
- sediment dispersal, Magdalena Valley 371, 357–362
- sediment thickness distribution
 Kura valley 159, 167–173, 177–179, 185
- sediment transport 167, 172, 173, 178–179
- sedimentation rate
 Eastern Cordillera 295, 296–298, 304, 305, 307–310, 393
 and inversion 421–423, 424, 428
 Magdalena Valley 337, 339, 340, 363
- sedimentology, Nuevo Mundo 318, 321, 324–335
- seismic interpretation, N Andes 448–452
- seismic profile 228–229, 237
 Apulia 184, 186
 Castilla–Chichimene province 454–461
 Colombian Andes 426–428, 449
 Eastern Cordillera 276, 449
 Golobar Fault 125, 129
 Llanos Basin 421
 Magdalena Valley 336, 337, 349, 354
 Middle Magdalena 354, 426–428
 Nuevo Mundo 335, 336–337
 Oriente basin 66–70
 salt pillows 47
 Sierra de Cantabria Frontal Thrust 124, 125
 Taribani anticline (Georgia) 174–175, 180–181
 Ubierna Fault 126, 128
 Ucayali Basin 47
- seismic province/profiles 444, 449
- seismicity 65, 109, 443
- seismostratigraphic units 449–454
- sequence stratigraphy sections 167
- shear fractures 167–168
- shortcut fault 93, 106
 Eastern Cordillera 258, 267, 276, 433
 Llanos foothills 196, 201–205, 207, 210, 217
 Magdalena foothills 224, 247, 248
 Pyrenees 149, 154
- shortening 1, 113, 141, 153
 central Andies 82, 97
 Eastern Cordillera 147
 estimate 258, 271–272
 High Atlas 142–143, 144
 Kura Valley 164, 185, 186
 Magdalena foothills 224, 250
 Pyrenees 121, 122, 132, 133, 149
 Tien Shan 36
- shortening and convergence 431
- shortening and displacement 190–201, 205–210, 212–217
- shortening and fault orientation 33, 37, 275
- shortening and stylolites 167

- shortening rate
 - Eastern Cordillera 412, 415, 419, 426–431, 433, 437, 438
 - in experiment 49–51, 54–56
 - Magdalena foothills 251
- shortening, comparing interpretations 273
- shortening, fault data **196–197**
- Sierra de Cantabria Frontal Thrust 124, 125, 126, 133
 - displacement 134–135
- Sierras Pampeanas 101, 111, 114
- slab migration 5, 7, 9
- slab subduction 60, 103
- slab-pull forces 141, 153
- slickenside 131, 133, 168
- slip data **197**
- slip rates 433
- soft linkage 215, 218
- software, 2Dmove 193
- software, HeFTy 318, 347, 395, 399, 414, 415, 423, 428, 429
- source rock 47–48, 59, 63, 70, 72
- South American plate 456–457, 464–465
- stereograms, faults 133
- stereograms, Tien Shan 32, 34
- strain 3
- strain hardening 433
- stratigraphic analysis 109–111
- strength, inherited 2, 3, 7, **11**, 14
- stress 167–168, 171, 176–177, 182, 185
- stress and GPS data 268–269
- stress and structural style 250–252
- stress domain 36, 412, 413
 - Eastern Cordillera 268–271, 275, 277
- stress orientation 343, 346, 362–363
- stress riser 234, 247, 250
- stress trajectory 444, 448, 452, 455, 457, 468
 - Eurasia 166
- strike-slip faults 250, 413
 - central Andes 111–113
 - Eastern Cordillera 269
 - Pyrenees 119, 121, 125, 131–135
- structural analysis, central Andes 111–113
- structural inheritance 19–40
- structural relief 144–145, 149–153
 - Eastern Cordillera 267
 - Magdalena foothills 250
- structural style and
 - determining factors 250–252
 - geometry 258
 - graben development 257–279
 - pre-existing features 258–262, 279
 - seismic analysis 106–109
 - shortening 195–201, 212–217
- structure, localization of propagation 43–56
 - experiment set up 49
 - modelling 50–51
 - results 51–55
- study areas, location 12–13
- stylolites 167–168, 177
- sub-Andean fold and thrust belt 61–62, 64–65
 - age 70
- sub-Andean play 72
- subduction 60–61, 160
 - advance 443, 464
 - advance/retreat 5, 6–7
 - Andean 102–104, 113
 - Caribbean crust 288, 305, 308, 310
 - Eastern Cordillera 268
 - Iberian Plate 122
- subduction/collision transition 3
- synorogenic sediments
 - Cordillera Oriental 80, 81, 84, 85, 88, 90, 94, 96
- syn-rift faults, Cordillera Oriental 79, 95–96
- syn-rift sediments 81, 84, 85, 88, 90, 92, 128, 130
 - Argentina, NW 104, 107, 112, 114
 - Eastern Cordillera 415, 419
 - Magdalena Valley 230–231
 - Pyrenees 123
- tectonic acceleration 423, 426–429
- tectonic control and sedimentation 339–340
- tectonic domains, Oriente Basin 64–67
- tectonic event, far-field 406
- tectonic inheritance 189, 190, 217, 218
- tectonic inversion *see* inversion
- tectonic quiescence 419, 421–422
- tectonic setting, categories 2–7
- tectonic underplating 5
- tectonics and sedimentation, Nuevo Mundo 339–340
- tectonostratigraphic evolution 307–310
- temperature and deformation 3, 7
- temperature/time path 325, 398, 405, 423, 432, 434
- tensile fractures 167–168
- Tesalia–Lengupa system **196–197**, 206, 226
 - exhumation 445
- Tethys stratigraphy **162**
- Tethys subduction 160–162, 164
- thermal history
 - Eastern Cordillera 414, 415, 432
 - Magdalena foothills 235, 239, 244
- thermal inverse model 398
- thermal model 423, 434
- thermal regime 185
- thermal subsidence 79, 88, 109
- thermochronology 62, 193
 - Eastern Cordillera 309–310, 394–397, 398, 419, 423, 427
 - Magdalena foothills 241, 245, 250
 - Magdalena Valley 325, 349, 353, 354–359, 361
 - Nuevo Mundo 316, 317–321, 335
- thermochronology data 444–448, 461
- thermochronology, use of 13
- thermochronometrical data
 - Eastern Cordillera 371, **388**, 397
 - Magdalena Valley 344, 346–348, 355, 356, 359, 363
- thermometry, Peru 46, 48

- thickness maps *see* isopach maps
 thickness variation and age control 291, **293–294**
 thick-skin orogen, controlling factors 443–469
 thick-skin provinces 1–14
 thick-skin tectonic style 77–98
 thick-skin tectonics 59–73
 thick-skinned thrusting 19–40
 thick- to thin-skin tectonics 160, 163, 167, 181–186
 thin-skin belt 413
 thin-skin orogens 43, 46
 thin-skin structures
 NW Argentina 107, 111–114
 thin- to thick-skin tectonics, foothill belts
 Llanos 189, 190, 195–198, 201, 205, 210, 215–218
 Middle Magdalena 221–252
 Oriente Basin 59
 thin- to thick-skin transition 119–136
 thrust belt
 Kura Valley 163, 189–218, 413
 Pyrenees 141–149
 thrust belt front 343
 thrust propagation, experiment 52–56
 thrusting, age, High Atlas 144
 thrusting, thick-skin 19–40
 thrusting, thin-skin 146–147, 340, 443, 458
 thrusts 49, 107, 109, 111
 Cordillera Oriental 81, 83, 85–96, 97
 Kura Valley 162, 165, 182
 Pyrenees 122, 123
 Tien Shan foreland 19–40
 Cenozoic deformation 32–33
 reactivation 33–35, 38
 stratigraphy 20–25
 structure 25–27
 thick-skin 27–28
 timing 28–32
 time-temperature path 325, 398, 405, 423, 432, 434
 timing, subduction, Peru 45
 titanite 301, 304, 308
 topographic barrier 151
 topographic growth 404, 405
 topographic profile and earthquake data 450–451
 topography 104
 asymmetric 452, 466, 469
 Colombian basins 414
 NW South America 413
 topography and inversion 141–154
 topography and structure 147, 193, 369, 431, 438
 topography and tectonics 28, 30, 144–145, 179, 181
 Eastern Cordillera 267, 268
 Toraygyr Fault 27, 33, 34
 transpression 456, 457, 468
 Eastern Cordillera 265, 268–271, 275–277
 Pyrenees 124–135
 Tien Shan 20
 Tres Cruces sub-basin 103
 Tres Cruces Thrust 90
 trishear fault-propagation fold 27, 29
 tuff cone, seismic section 67
 Ubierna Fault System 124–130, 132, 133
 Ucayali Basin, décollement 43–56
 deformation 48–49
 geology 44–46
 petroleum system 47–48
 structural model 46–47
 U–Pb age/data 238, 244, 290, 427, 432
 Eastern Cordillera 258, 260, 261
 Floresta 424
 Llanos foreland 445
 Magdalena Valley, 347, 349, 357, 358–360, 362
 Nuevo Mundo 317–340 *passim*, 357, 359
 unconformity, Late Cretaceous–Cenozoic 346, 348–349, 361
 U–Pb in drainage study 371–372
 sample data **373–383**
 source area signature 387, 390–394, 395, 397
 provenance 400–402, 403, 404
 (U–Th)/He *see* ZHe
 uplift 151, 405
 Eastern Cordillera 145
 High Atlas 143–145
 Nuevo Mundo 335
 Pyrenees 125, 149
 uplift, timing 346, 362
 Magdalena Valley 349, 356–357, 359
 uranium-lead *see* U–Pb
 Variscan structure 123, 130
 veins, extension 167–168, 176, 182
 velocity conditions 10
 velocity of deformation 224
 velocity ratio 49, 50
 Venezuela, thrustbelt 190, 192
 vitrinite reflectance 71, 309
 Andes, NW 444–448
 Eastern Cordillera 403
 Llanos foothills 201
 Magdalena Valley 346, 348, 353–357
 Middle Magdalena belt 233, 234, 238, 241–245
 Nuevo Mundo 317, 319, **321**, 325
 Ucayali Basin 45, 46, 47, 48
 vitrinite reflectance data **243**, **321**, **353**
 Volador structure 233, 238–239, 249
 volcanism 103–104, 309
 weak scenario 7
 Western Cordillera 60, 412
 whale-hump profile 27, 28
 Wheeler diagram 403
 Yopal Fault 200, 201, 245, 251
 exhumation 445, 447
 shortening **196–197**, 198, 205–207

- ZFT data (zircon fission-track) 414
 drainage study 369
 Llanos foothills 201, 210–212, 248, 277
 Magdalena Valley 346, 347, **352**, 354–357
- ZHe data (zircon uranium-thorium/helium) 210–212,
 277, 414
 drainage study 369
 Floresta 424
 Llanos foreland 445–448
 Magdalena Valley 346, 347, 349, 353, 355–356, 362
 Middle Magdalena 239–241, 245, 248
 Nuevo Mundo 317, 319, 320, **322**, 325, 335
- zircon crystallization age 290–291
zircon detrital age population 299, 301–304, 307–310
 data analysis 302–303
zircon fission-track data *see* ZFT
zircon uranium lead age
 Pyrenees 153
 see also under U–Pb
zircon uranium-thorium/helium *see* ZHe