

# Index

Page numbers in *italics* refer to Figures. Page numbers in **bold** refer to Tables.

- Aglar Thrust 113, 116
- Almora Group 84
- Almora klippe 82–83, 83, 84
- deformation history and structure 85
- geological setting 83–85
- study of fission track thermochronology
- method 96–97
- results 97, 98, 99, **100**
- study of microfabric 85–86
- quartz *c*-axis fabrics 86–89
- strain analysis 89, **91**
- study of microstructure and deformation temperature
- 89–90, 92, 94–95
- study results discussed 99, 103–104
- summary 104
- tectonic evolution model *102*
- Almora Shear Zone (ASZ) 83
- Almora Thrust 114
- Almora–Askot–Dharamgarh gneiss 321
- Almora–Dadeldhura klippe 259
- apatite fission track thermochronology
- Almora klippe
- method 96–97
- results 97, 98, 99
- Arunachal Himalaya
- methods 68
- results 68–69
- thermal model 69–70
- thermochronology v. tectonics and climate 70–72
- <sup>39</sup>Ar–<sup>40</sup>Ar dating
- advantages of 129–130
- method 138
- results 138–139
- results discussed 140
- Aravalli craton 254
- Aravalli–Delhi fold belt 254, 255
- Arunachal Himalaya 67–68, 299–301
- apatite fission track age study
- methods 68
- results 68–69, **69**
- thermal model 69–70
- thermochronology v. tectonics and climate 70–72
- results discussed 72–76
- summary 76
- Subansiri region metagranitoids
- methods of analysis
- geochemistry 303
- zircon Hf 308
- zircon U–Pb 303, 308
- petrography 301
- results
- geochemistry **302**, **303**, 308
- zircon Hf **306**, **307**, 311
- zircon U–Pb **304**, **305**, 308, 309–310
- results discussed 311–316
- summary 316
- Askot klippe 82–83
- back-structures
- Lesser Himalaya study 111–113
- classification
- Group (1) 116–117
- Group (2) 117–119
- Group (3) 119
- Group (4) 119–120
- field work 115–116, *116*
- summary 120
- back-thrusts
- defined 111
- importance of 111
- Bajjnath klippe 82–83
- Balakot Bagh Fault 53
- Bandal Granitoid 321
- Bangong–Nujiang Suture 252, 255
- Bastar–Bhandara craton 254
- Basul Thrust 113, 116
- Berinag Formation 115, *117*, 130, 212–213
- Berinag Thrust 113, *119*
- Berinag–Tons Thrust 113
- Bhainskati Formation 50
- Bhappkund Formation 131–132
- Bhatwari Gneiss 321
- geological setting 321–324
- methods of analysis 324–325
- results
- bulk rock geochemistry 325–329, *330*
- zircon U–Pb 329, **331–332**
- results discussed
- magmatism and tectonics 333
- petrogenesis 333–336
- summary 335, 336
- Bhatwari Group 320, 321
- Bihar–Nepal earthquake 263
- Bilaspur Thrust 50
- biotite dehydration 149
- Blaini Formation *118*
- Bomdila Granite Gneiss 321, *342*, 343
- geological setting 343, *344*, 345
- methods of analysis 345–346
- results
- petrography and mineral chemistry 346–351, *347*, **348**, **349**, **350**, **353**
- whole-rock geochemistry 351, 354–355, **356**, **357**, **358–361**, 362
- zircon Hf 362–363, **368**, 369
- zircon U–Pb 362, **366**, 367
- results discussed
- evolutionary processes 367, 369–370
- field and petrographic evidence 363–365, 367
- Lu–Hf evidence 372
- magma differentiation 370–372
- role of Columbia supercontinent 372
- thermometry 370
- summary 372–373
- Bomdila Group *342*, 343
- Bome Thrust 66, 67
- Bouguer gravity data 258

- Budhakedar Thrust 114  
 Bundelkhand craton 254, 256, 258  
 Bundelkhand–Aravalli Craton 343
- Central Gneissic Complex 255  
 Central Himalaya  
   defined 41–42, 47  
   earthquakes 52–53  
   seismotectonics 51–52  
   summary 56–57  
   tectonic framework 47  
     foreland basin configuration 50  
     Lesser Himalaya 49–50  
     Main Central Thrust 47–49
- Central Indian tectonic zone 254, 255  
 Chail Gneiss 321  
 Chamba Fault 44  
 Chamba nappe 49  
 Champawat Granitoid 84–85  
 Chandpur Formation 113  
 channel-flow mechanism 20, 41  
 Chhotanagpur gneiss complex 254  
 Chiplakot Crystalline Belt (CCB)  
   geological setting 212–213, 212  
   lazulite study 211  
     geological setting 212–213, 212  
     methods of analysis 213–214  
     occurrence 213  
     results  
       composition 214–215  
       fluid inclusions 215–220  
       microthermometry and Raman spectra 220–222  
       petrography 214  
       results discussed 222–227  
       summary 227
- Chirpatiya gneiss 321  
 climate and exhumation in Arunachal Himalaya  
   thermochronology v. tectonics and climate 70–72,  
   72–76
- convergence and collision 252  
 convergence rate 42  
 cooling ages *see* apatite fission track thermochronology
- Dadeldhura nappe 49  
 Dadeldhura Thrust Sheet 46, 49  
 Darjeeling–Sikkim Granite Gneiss 321  
 Dauki Fault 257  
 Debguru Porphyroid 85  
 Deccan Traps 254, 255  
 Dehradun Lineament 258  
 Delhi–Haridwar Ridge (DHR) 115, 254, 255,  
   258, 263
- Deoban Formation 113, 115  
 Deosari Syncline 113, 116  
 Dhabri Fault 257  
 Dharasu Formation 114  
 Dharasu Thrust 114, 119  
 Dharkot Dislocation 144  
 diamond production 256  
 Dichli Dolomite 114  
 dravite 175–176  
   *see also* tourmaline
- Dumri Formation 50  
 Dunda Thrust 114, 119  
 Dundwar range promontary 261
- dykes  
   geochemical significance 231–232  
   Ladakh batholith dykes  
     geochemical characterization  
       methods 234–235  
       results 236–237  
       Haskin's approach 237–238  
       hierarchical clustering and multidimensional  
       scaling 238–243  
       isotopic evidence 247–248  
       literature reports compared 243–247  
     results discussed 248–249  
     summary 249
- earthquake records 42, 45  
   (1100) 55  
   (1255) 52, 55  
   (1344) 52, 56  
   (1505) 52, 55–56, 263  
   (1555) 55  
   (1803) 53  
   (1833) 52–53  
   (1934) 53  
   (1980) 262  
   Bihar–Nepal (1988) 263  
   giant 55–56  
   Gorkha (2015) 7, 9, 12–13, 14, 53, 263  
   Kangra (1905) 53, 55  
   Kashmir (1885) 55  
   Kashmir (2005) 53  
   Lesser Himalaya 114–115  
   plate boundary, Central Himalaya 52–53  
   Sikkim (2011) 263  
   wedge thrust, NW Himalaya 53, 55
- East Patna Fault 257  
 Eastern Ghats belt 254, 255  
 Eastern Himalayan segment 41–42, 74  
 erosion *see* exhumation  
 Eurasian Plate 23  
 exhumation history 65  
   *see* Arunachal Himalaya
- Faizabad Ridge 254, 255, 259, 261, 263  
 fault modelling, sandbox and centrifuge 264, 265, 266  
 faults and thrusts  
   Aglar Thrust 113, 116  
   Almora Thrust 114  
   back-thrusts 114  
   Balakot Bagh Fault 53  
   Basul Thrust 113, 116  
   Berinag Thrust 113, 119  
   Bilaspur Thrust 50  
   Bome Thrust 66, 67  
   Budhakedar Thrust 114  
   Chamba Fault 44  
   Dadeldhura Thrust Sheet 46, 49  
   Dauki Fault 257  
   Dhabri Fault 257  
   Dharasu Thrust 114, 119  
   Dunda Thrust 114, 119  
   East Patna Fault 257  
   fore-thrusts 111  
   Gangori–Jamak Fault 113  
   Garhwal Thrust 113  
   Gozha Fault 22

- Great Boundary Fault (GBF) 255, 257  
 Great Counter Thrust (GCT) 128, 320  
 Herat Fault 21  
 High Himal Thrust (HHT) 149  
 High Himalayan Discontinuity (HHD) 147, 149  
 Himalayan Frontal Thrust (HFT) 20, 21, 22, 41, 42, 43, 45, 46, 300  
 Indus Counter Thrust (ICT) 42  
 Jhala Normal Fault 320  
 Jutogh Thrust 114  
 Kasun Thrust (KT) 82, 114  
 Kathu-ki-chail Thrust 113, 117  
 Khairabad Fault 268  
 Kishangang Fault 257, 261  
 Krol Thrust 113  
 Lucknow Fault 257  
 Main Boundary Thrust (MBT)  
   location maps 20, 21, 42, 43, 44, 45, 46, 66, 82, 84, 128, 253, 278, 320, 342  
   relation to Lesser Himalayan Sequence 22, 41, 50, 65, 66, 67, 81, 113, 130, 253, 254, 263, 277, 279, 300, 341  
   seismicity 263  
 Main Central Thrust (MCT) 20, 22, 41, 65, 68, 81, 113, 130, 147, 253, 259, 263, 277, 300, 319, 341,  
   age 129  
   definition 129  
   lazulite study 211–212, 212  
   location maps 20, 21, 42, 43, 44, 45, 46, 66, 82, 128, 131, 253, 320, 342  
   position in NW and Central Himalaya 47–49  
   Tamor–Ghunsa transect 150  
 Main Frontal Thrust (MFT) 65, 67, 81, 130, 253, 261, 279  
   location maps 66, 128, 253, 255, 278, 320  
 Main Himalayan Thrust (MHT) 7, 42, 65, 253, 253, 261, 263, 264  
 Main Karakoram Thrust (MKT) 20  
 Main Mantle Thrust (MMT) 22, 278, 279  
 Medicott Wadia Thrust (MWT) 44, 50  
 Munsiari Thrust (MT) 81, 82, 114, 119, 129, 130, 131, 319, 320  
 Nalupani Fault 114  
 North Almora Thrust (NAT) 43, 82, 83, 84, 113, 114  
   microfabric studies 86–89  
   microstructure and deformation temperature 89–90, 92, 92, 93, 94  
   modelling evolution 99, 102, 103–104  
 North Dadeldhura Thrust (NDT) 83  
 Ramgarh Thrust (RT) 49, 82, 83, 84  
   deformation history and structure 85  
   fission track thermochronology  
     method 95–96  
     results 97, 98, 99, **100**  
   geological setting 85  
   microfabric studies 85–86  
     quartz *c*-axis fabrics 86–89  
     strain analysis 89, **91**  
   microstructure and deformation temperature 93, 95–96  
   modelling evolution 99, 102, 103–104  
 Ramgarh–Munsiari Thrust (RT) 41, 43, 46  
 Reasi Thrust 50  
 Ropar–Manali Fault 47, 50–51  
 Salt Range Thrust (SRT) 20, 21  
 South Almora Thrust (SAT) 82, 83, 84  
   microfabric studies 86–89  
   microstructure and deformation temperature 93, 95  
   modelling evolution 99, 102, 103–104  
 South Dadeldhura Thrust (SDT) 83  
 Srinagar Thrust 113, 115  
 Talkot Thrust 46  
 Tons Thrust (TT) 43, 82, 113, 117, 119  
 Uttarkashi Thrust 113, 114, 119  
 Vaikrita Thrust (VT) 81, 82, 99, 114, 129, 130, 319, 320  
   petrography and microstructural study methods  
     Ar–Ar dating 138–139, 139, 140  
     mineral chemistry 134  
       biotite 134, **135**, 136  
       muscovite 134, **135**  
     sampling 132, 133  
     titanium geothermometry  
       biotite 136, 137, 137, 138  
       muscovite 136, 137–138, 137, 138  
     results discussed 139–142  
     summary 142–143, 142  
   setting 130–132  
 West Patna Fault 257  
 Western Kunlun Shan Fault (WKSF) 20, 21  
 finite strain analysis 89  
 fission track thermochronology  
   apatite  
     Almora klippe  
       method 96–97  
       results 97, 98, 99  
   Arunachal Himalaya  
     methods 68  
     results 68–69  
       thermal model 69–70  
       thermochronology v. tectonics and climate 70–72  
   zircon  
     method 96–97  
     results 97, 98, 99  
 fluid inclusion studies  
   lazulite 215–220  
 fore-thrusts, defined 111  
 Galensiniak Formation 68  
 Ganga Basin 254, 255  
 Gangori–Jamak Fault 113  
 Garhwal *see* Lesser Himalaya back-structure studies  
 Garhwal Group 114, 320  
 Garhwal Lesser Himalaya 130  
   back-structure studies 111–113  
   field work 115–116, 116  
   genesis  
     Group (1) 116–117  
     Group (2) 117–119  
     Group (3) 119  
     Group (4) 119–120  
   summary 120  
   geological setting 113–114  
     deformation 114  
     metamorphism 114  
     seismicity 114–115  
 Bhatwari Gneiss 321  
   geological setting 321–324

- Garhwal Lesser Himalaya (*Continued*)  
 methods of analysis 324–325  
 results  
   bulk rock geochemistry 325–329, 330  
   zircon U–Pb 329, **331–332**  
 results discussed  
   magmatism and tectonics 333  
   petrogenesis 333–336  
   summary 335, 336
- Garhwal thrust 113
- Garu Formation 67
- geochemistry  
 Mansehra granite  
   methods 281  
   results 282–283, 288
- Ladakh dykes  
 geological setting 232–234  
 methods 234–235  
 results 236–237  
   Haskin's approach 237–238  
   hierarchical clustering and multidimensional  
   scaling 238–243  
   isotopic evidence 247–248  
   literature reports compared 243–247  
   results discussed 248–249  
   summary 249
- geothermometry, titanium  
 methods 136–138  
 results 136, 137, 138
- Ghuttu Gneiss 321
- Global Navigation Satellite System (GNSS) 7
- Gondwana break-up 252
- Gondwana Group 66, 67
- Gorkha earthquake (2015) 7, 10, 11, 12–13, 263
- Gozha Fault 22
- granites  
 Greater Himalaya zone 277, 278  
 Mansehra granite 278–279  
   geological setting 279  
   methods of analysis  
     sampling 279–280  
     Sr–Nd isotopes 281  
     whole-rock geochemistry 281  
     zircon Hf 282  
     zircon U–Pb 281–282  
 results  
   Sr–Nd isotopes 291, **291**  
   whole-rock geochemistry 282–283, 288  
   zircon Hf 291–292  
   zircon U–Pb **284 285, 286, 287**, 288–290  
 results discussed 292–296  
 summary 296
- granitoids 299
- gravity variation 23
- Great Boundary Fault (GBF) 255, 257
- Great Counter Thrust (GCT) 128, 320
- Great Himalayan Crystalline Complex 320
- Greater Himalayan Sequence (GHS) 128, 129, 130, 252,  
 259, 277, 300
- Gumalikhet Formation 84
- Gwalda Gneiss 321
- Hakale granite 279
- Hanuman Chatti Gneiss 321
- Harsora granites 342
- Hazara syntaxis 279
- Herat Fault 21
- High Himal Thrust (HHT) 149
- High Himalayan Crystalline Sequence (HHCS) 147, 148,  
 150, 319  
 partial melting study 149  
 methods  
   P–T pseudo-section 154, 155  
   petrology  
     cordierite migmatites 151–152, 153  
     granitic orthogneiss 152, 153, 154  
     sillimanite orthogneiss 152, 153  
   U–Pb ages 154, 156, 158, **158, 159**, 160, 161, 162,  
   163, 165  
 results discussed 158, 163–164, 166–169  
 summary 169
- High Himalayan Discontinuity (HHD) 147, 149
- Higher Himalaya 300
- Higher Himalaya Crystallines (HHC) 21, 22, 41, 49, 65,  
 66, 67, 67–68, 81, 212  
 exhumation history 67  
 modelling emplacement 99, 102, 103–104
- Himalaya–Karakorum–Tibet (HKT) system, defined 1
- Himalaya–Tibetan orogen 21
- Himalayan arc, segments 41
- Himalayan Frontal Thrust (HFT) 20, 21, 22, 41, 42, 43, 45,  
 46, 300
- Himalayan Orogen 65, 81, 130, 149  
 along-strike variation 251–252  
 influence of basement faults 258–259  
   lateral ramps and foreland evolution 260–261  
   metamorphic core development 259–260  
   modelling of 264, 265, 266  
   seismicity 263–264  
   summary of observations discussed 266–268  
     conceptual model 268–269, 268  
     Tibet graben 261–263  
   lithotectonic domains 252, 260  
   tectonostratigraphic zones 277
- Himalayan wedge 21–22, 22, 23
- Hindu Kush, earthquake focus 19, 23
- Hinge Zone 257
- Hyderabad GNSS station **8, 13, 15, 16**
- index minerals 211  
*see also* lazulite
- India  
 basement faults 256–257  
 influence on Himalayan Orogen 258–259  
   conceptual model 268, 268–269  
   lateral ramps and foreland evolution 260–261  
   metamorphic core development 259–260  
   modelling 264, 265, 266  
   summary of observations discussed 266–268  
   Tibet graben 261–263  
 influence on seismicity 263–264  
 basement features 254–256  
 deep structure 258  
 lithotectonic units 254, 255
- Indian Plate, underthrusting/subduction 22, 23, 252
- Indian Tsangpo Suture (ITS) 20
- Indian–Eurasian Plate collision 22, 41, 176
- Indo-Gangetic Plain (IGP) 20, 21, 23
- Indo-Myanmar Ranges (IMR) 195
- Indus Counter Thrust (ICT) 42

- Indus Suture 177  
 Indus–Tsangpo Suture Zone (ITSZ) 22, 23, 128, 176, 177, 277, 278, 320  
 Indus–Yarlung Zangbo Suture (IYZS) 253, 253, 254, 255  
 International GNSS Service stations **8**, 9, **13**, **15**, **16**  
 Intra-Greater Himalayan Crystalline Thrust 114  
 Iskere Gneiss 319
- Jajarkot klippe 259  
 Jhala Normal Fault 320  
 Joshimath Formation 131  
 Jutogh Thrust 114
- Kaimur Group 256  
 Kalat kang Granite Gneiss 321  
 Karakoram Fault (KF) 19, 21, 22, 177, 255  
 Karsog granite 49  
 Kashmir Basin 128  
 Kashmir nappe 49  
 Kasun Thrust (KT) 82, 114  
 Kathmandu Lineament 257  
 Kathmandu nappe 49  
 Kathmandu Valley, earthquakes 52  
 Kathu-ki-chail Thrust 113, 117  
 Khairabad Fault 268  
 Khelong Formation 67  
 Khetabari Group 67  
 kimberlite pipes 256  
 Kimin Formation 300  
 Kishangang Fault 257, 261  
 Kitab GNSS station **8**, **13**, **15**, **16**  
 Kohistan Batholith 177  
 Kohistan–Ladakh arc 22  
 Kolkata Lineament 257  
 Kot Syncline 113  
 Kotla Gneiss 319  
 Krol thrust 113  
 Kullu–Bajura Mylonitized Gneiss 321  
 Kunlun wedge 22
- Ladakh arc 21  
 Ladakh Batholith 177, 231  
 dykes study  
   geochemical characterization  
   methods 234–235  
   results 236–237  
   Haskin’s approach 237–238  
   hierarchical clustering and multidimensional scaling 238–243  
   isotopic evidence 247–248  
   literature reports compared 243–247  
   results discussed 248–249  
   summary 249  
   geological setting 232–234  
 Lansdown klippe 82–83  
 lazulite 211  
   geological setting 212–213, 212  
   methods of analysis 213–214  
   occurrence 213  
   results  
     composition 214–215  
     fluid inclusions 215–220  
     microthermometry and Raman spectra 220–222  
     petrography 214  
     results discussed 222–227  
     summary 227  
 Lesser Himalaya (LH) 21, 22, 277  
 Garhwal back-structure studies 111–113  
   field work 115–116, 116  
   genesis  
     Group (1) 116–117  
     Group (2) 117–119  
     Group (3) 119  
     Group (4) 119–120  
   summary 120  
   geological setting 113–114  
     deformation 114  
     metamorphism 114  
     seismicity 114–115  
 granites 277, 278  
   Mansehra granite 278–279  
     geological setting 279  
     methods of analysis  
       sampling 279–280  
       Sr–Nd isotopes 281  
       whole-rock geochemistry 281  
       zircon Hf 282  
       zircon U–Pb 281–282  
   results  
     Sr–Nd isotopes 291, **291**  
     whole-rock geochemistry 282–283, 288  
     zircon Hf 291–292  
     zircon U–Pb **284** **285**, **286**, **287**, 288–290  
     results discussed 292–296  
     summary 296  
   tectonic framework 49–50  
 Lesser Himalayan Belt 341  
 Lesser Himalayan Crystalline (LHC)  
   klippen/nappe 83  
 Lesser Himalayan duplex 41, 46, 49–50  
 Lesser Himalayan Metasedimentary Sequence (LHMS)  
   81, 84, 212  
   finite strain data **91**  
   modelling evolution 99, 102, 103–104  
 Lesser Himalayan Sequence (LHS) 65, 66, 67, 128, 129, 130, 148, 252, 300, 319, 320  
 Lhasa GNSS station **8**, **13**, **15**, **16**  
 Lingtse Granite Gneiss 321  
 lithosphere  
   Rayleigh wave study  
     method 23  
     data processing  
       dispersion curve 23–24  
       inversion for group velocity 24–27  
       inversion for S-wave velocity 27–29  
     results and discussion 29–36  
     summary 36  
     structure 22, 23  
 low-velocity zone 20, 41  
 Lucknow Fault 257  
 Lucknow GNSS station **8**, **13**, **15**, **16**  
 Lucknow Lineament 257, 259, 260, 261
- Mahakoshal Belt 343  
 Main Boundary Thrust (MBT)  
   location maps 20, 21, 42, 43, 44, 45, 46, 66, 82, 84, 128, 253, 278, 320, 342

- Main Boundary Thrust (MBT) (*Continued*)  
 relation to Lesser Himalayan Sequence 22, 41, 50, 65, 66, 67, 81, 113, 130, 253, 254, 263, 277, 279, 300, 341  
 seismicity 263
- Main Central Thrust (MCT) 20, 22, 41, 65, 68, 81, 113, 130, 147, 253, 259, 263, 277, 300, 319, 341,  
 age 129  
 definition 129  
 lazulite study 211–212, 212  
 location maps 20, 21, 42, 43, 44, 45, 46, 66, 82, 128, 131, 253, 320, 342  
 position in NW and Central Himalaya 47–49  
 Tamor–Ghunsa transect 150
- Main Frontal Thrust (MFT) 65, 67, 81, 130, 253, 261, 279  
 location maps 66, 128, 253, 255, 278, 320
- Main Himalayan Thrust (MHT) 7, 42, 65, 253, 253, 261, 263, 264
- Main Karakoram Thrust (MKT) 20
- Main Mantle Thrust (MMT) 22, 278, 279
- Malari pluton 132
- Mandhali Formation 113, 115
- Manipur Ophiolite Complex (MOC) 195  
 geochemical study  
 methods 198–199  
 results 199  
 major and trace elements **200**  
 REE 201, 203  
 Sr and Nd isotopes 202, **202**  
 results discussed 199, 201–202, 204–207  
 summary 206, 207  
 geological setting 196
- Mansehra granite 278–279  
 geological setting 279  
 methods of analysis  
 sampling 279–280  
 Sr–Nd isotopes 281  
 whole-rock geochemistry 281  
 zircon Hf 282  
 zircon U–Pb 281–282
- results  
 Sr–Nd isotopes 291, **291**  
 whole-rock geochemistry 282–283, 288  
 zircon Hf 291–292  
 zircon U–Pb **284 285, 286, 287**, 288–290  
 results discussed 292–296  
 summary 296
- Martoli Group 320
- maruyamaite 175–176
- Marwar Basin 254
- Mata Volcanics 114
- Mazar Tagh Fault 21, 22
- Medlicott Wadia Thrust (MWT) 44, 50
- Meghalaya Plateau 343
- Menga Window (MW) 66, 68
- metagranitoids, Subansiri  
 methods of analysis  
 geochemistry 303  
 zircon Hf 308  
 zircon U–Pb 303, 308  
 petrography 301
- results  
 geochemistry **302, 303**, 308  
 zircon Hf **306, 307**, 311  
 zircon U–Pb **304, 305**, 308, 309–310  
 results discussed 311–316  
 summary 316
- mica dehydration 149
- Mikir Hills 343
- modelling, sandbox and centrifuge 264, 265, 266
- Moho  
 depth 22, 23  
 geometry, Rayleigh wave study 20, 21  
 method 23  
 data processing  
 dispersion curve 23–24  
 inversion for group velocity 24–27  
 inversion for S-wave velocity 27–29  
 results and discussion 29–36  
 summary 36
- monazite dating, HHCS 154, 156, 158, **158**
- monsoons and exhumation, Arunachal Himalaya 70–72
- Munger–Saharsa Ridge 254, 255, 258, 261, 263
- Munsiari Formation 83, 130, 319, 321
- Munsiari Thrust (MT) 81, 82, 114, 119, 129, 130, 131, 319, 320
- Murree Formation 50
- muscovite dehydration 149
- Mussoorie Syncline 113, 115, 116, 119
- Nagaon Lineament 115
- Nahan Thrust 50
- Naitwar Gneiss 321
- Nalupani Fault 114
- Namik Gneiss 321
- Nanga Parbat Haramosh syntaxis 268, 279
- Natala Anticline 113
- Nathuakhan Formation 85
- Nd–Sr isotope studies  
 Ladakh dykes 247–248  
 Manipur Ophiolite Complex 202, **202**  
 Mansehra granite 281, 291, **291**
- Neotethys Sea 176, 252
- Nerueadamar pluton 343
- North Almora Thrust (NAT) 43, 82, 83, 84, 113, 114  
 microfabric studies 86–89  
 microstructure and deformation temperature 89–90, 92, 92, 93, 94  
 modelling evolution 99, 102, 103–104
- North Dadeldhura Thrust (NDT) 83
- NW Himalaya  
 defined 47  
 earthquakes 53, 55  
 seismotectonics 52  
 summary 56  
 tectonic framework 47  
 foreland basin configuration 50  
 Lesser Himalaya 49–50  
 Main Central Thrust 47–49
- Nyimaling granite 177
- ophiolite complex, Manipur 195  
 geochemical study  
 methods 198–199  
 results 199  
 major and trace elements **200**  
 REE 201, 203  
 Sr and Nd isotopes 202, **202**  
 results discussed 199, 201–202, 204–207

- summary 206, 207  
geological setting 196
- Palaeotethys Sea 252  
Palampur Thrust 50  
Pamir arc 21  
Panjal Imbricate Zone (PIZ) 48  
Panjal Thrust (PT) 44, 49  
Panna diamond belt 256  
Pari Formation 68  
partial melting 23, 149  
Peshawar Basin 128  
Pididi Formation 68  
Pingla Fault 257  
Pokhara Lineament 257, 259, 261  
Port Blair GNSS station **8, 13, 15, 16**  
precipitation and exhumation, Arunachal Himalaya 70–72  
Puga Formation 176, 178  
Puga gneisses 176, 177, 178  
Pujaragaon Syncline 114  
Pyramid Laboratory GNSS station 7, 8, **8, 9, 9, 10, 12**
- Qiangtang 22  
quartz *c*-axis fabric analysis 86–89  
quartz vein study, fluid inclusions 230
- Rajasthan craton 258  
Rajmahal Traps 255  
Raman spectroscopy 220–222  
Rameshwar Granitoid 321  
Ramgarh Gneiss 321  
Ramgarh Group 83, 320  
Ramgarh Thrust (RT) 49, 82, 83, 84  
deformation history and structure 85  
fission track thermochronology  
method 95–96  
results 97, 98, 99, **100**  
geological setting 85  
microfabric studies 85–86  
quartz *c*-axis fabrics 86–89  
strain analysis 89, **91**  
microstructure and deformation temperature 93, 95–96  
modelling evolution 99, 102, 103–104  
Ramgarh–Munsiari Thrust (RT) 41, 43, 46  
rare earth element (REE) analysis  
Ladakh dykes 234, 235, 236, 237–238, 238–243,  
243–247  
Manipur Ophiolite Complex 201, 203  
Mansehra granite 282, **282**, 283  
Rautgara Formation 89, 113, 115, 118  
Rayleigh waves 20, 21  
study of lithosphere and Moho  
method 23  
data processing  
dispersion curve 23–24  
inversion for group velocity 24–27  
inversion for S-wave velocity 27–29  
results and discussion 29–36  
summary 36  
Rb–Sr isotopes  
Mansehra granite 291  
Reasi Thrust 50  
Rihee-Ganga Gneiss 321  
Rongjeng granite gneiss 342  
Ropar–Manali Fault 47, 50–51  
Rupshu granite 177
- Salari Group 342  
Salkhala/Haimanta Formation 49  
Salt Range Thrust (SRT) 20, 21  
sapphire mines (Kashmir) 211  
Saryu Formation 84  
Satpura Mobile Belt 254  
schorl *see* tourmaline  
scorzalite 211  
Se La Group 68  
seismicity *see* earthquake records  
seismotectonics  
Central Himalaya 51–52  
NW Himalaya 52  
Sela Group 342  
Shaan Gneiss 319  
Shillong Plateau Complex 254, 255  
Shyok Suture 177  
Sikkim earthquake 263  
Simla Lineament 258  
Singhbhum craton 254  
Singuni Thrust 114, 119  
Siwalik Group 50, 66, 67, 148, 252, 254, 277, 342  
Siwalik (Outer) Himalaya (SH) 22  
Soan Thrust (ST) 44  
Son Narmada North Fault (SNNF) 255  
Son-Narmada Fault Zone 257  
South Almora Thrust (SAT) 82, 83, 84  
microfabric studies 86–89  
microstructure and deformation temperature 93, 95  
modelling evolution 99, 102, 103–104  
South Dadeldhura Thrust (SDT) 83  
South Tibet graben 261  
South Tibetan Detachment (STD) 20, 22, 41, 253,  
254, 257  
location maps 20, 21, 42, 43, 44, 45, 46, 253, 320, 342  
South Tibetan Detachment (STD) System (STDS) 65, 66,  
68, 81, 82, 128, 130, 147  
South Tibetan Detachment Zone 21  
Southern Tibet Detachment System 277  
Sr–Nd isotope analysis  
Mansehra granite 281, 291  
Srinagar Thrust 113, 115  
statistical analysis  
hierarchical clustering 238–243  
multidimensional scaling 238–243  
results discussed 248–249  
strain analysis 89  
Sub-Himalaya 21, 41, 67, 130, 148, 277, 300  
Sub-Himalayan Belt 260–261  
Sub-Himalayan Sequence 252  
Sub-Himalayan Thrust System 46, 81  
Subansiri metagranitoids  
methods of analysis  
geochemistry 303  
zircon Hf 308  
zircon U–Pb 303, 308  
petrography 301  
results  
geochemistry **302, 303**, 308  
zircon Hf **306, 307**, 311  
zircon U–Pb **304, 305**, 308, 309–310  
results discussed 311–316  
summary 316  
subduction-related processes  
Manipur Ophiolite Complex 201–202, 204–207  
Sundernagar Basin 50, 51

- Surraithota Formation 131–132  
 surface waves 20  
 Sutlej Basin 128
- Taliha Formation 68  
 Talkot Thrust 46  
 Tanawal Formation 279  
 Tanglang La Formation 177, 178  
 Tarim Basin 20, 21, 23  
 Tarim Plate 23  
 Tashigong Crystallines 68  
 tectonic framework, NW and Central Himalaya 47  
   foreland basin configuration 50  
   Lesser Himalaya 49–50  
   Main Central Thrust 47–49  
 Tehri Lineament 115  
 temperature measurements  
   microstructure and deformation  
     North Almora Thrust 89–90, 93, 94  
     Rangarh Thrust 95–96, 96  
     South Almora Thrust 93, 95, 96  
 Tethyan Himalayan Sequence (THS) 65, 67, 68, 81, 320  
   modelling emplacement 99, 102, 103–104  
 Tethyan Ocean, closure 130  
 Tethyan Sedimentary Sequence (TSS) 22, 130, 138, 252  
 Tethys Himalaya 41, 148, 277  
 Thakkhola graben 259  
 thermochronology  
   apatite fission track  
     Almora klippe  
       method 96–97  
       results 97, 98, 99  
     Arunachal Himalaya  
       methods 68  
       results 68–69  
       thermal model 69–70  
       thermochronology v. tectonics and climate 70–72  
   zircon fission track  
     method 96–97  
     results 97, 98, 99  
 thermometry, fluid inclusion 220–222  
 Thimpu Group 68  
 thrust systems *see* faults and thrusts  
 Tianshuihai Terrane 22  
 Tibetan Plate 22, 252  
 titanium geothermometry  
   methods 136–138  
   results 136, 137, 138  
 Tons Thrust (TT) 43, 82, 113, 117, 119  
 tourmaline 175–176  
   TMMC study  
     methods of analysis 178–179  
     results  
       classification 180–184, **182**  
       crystal chemistry 184–187  
       petrology 179–180  
       results discussed 187–190  
       summary 190  
 trace element analysis  
   Ladakh dykes  
     methods 234–235  
     results 236–237  
       Haskin's approach 237–238  
       hierarchical clustering and multidimensional  
       scaling 238–243  
       isotopic evidence 247–248  
     literature reports compared 243–247  
     results discussed 248–249  
     summary 249  
 Mansehra granite 281, 282, **282**  
 Tso Morari Crystalline Complex (TMCC) 176  
   geological setting 176–178, 177  
   tourmaline study  
     methods of analysis 178–179  
     results  
       classification 180–184, **182**  
       crystal chemistry 184–187  
       petrology 179–180  
       results discussed 187–190  
       summary 190  
 Tumiya pluton 343
- U–Pb ages, HHCS 154, 156, **158, 159**, 160, 161  
 Urumqui GNSS station **8, 13, 15, 16**  
 Uttarakhand, Garhwal Lesser Himalaya 130  
   back-structure studies 111–113  
   field work 115–116, 116  
   genesis  
     Group (1) 116–117  
     Group (2) 117–119  
     Group (3) 119  
     Group (4) 119–120  
   summary 120  
   geological setting 113–114  
   deformation 114  
   metamorphism 114  
   seismicity 114–115  
 Uttarkashi Thrust 113, 114, 119
- Vaikrita Group 83, 320  
 Vaikrita Thrust (VT) 81, 82, 99, 114, 129, 130,  
   319, 320  
   petrography and microstructural study  
   methods  
     Ar–Ar dating 138–139, 139, 140  
     mineral chemistry 134  
     biotite 134, **135**, 136  
     muscovite 134, **135**  
     sampling 132, 133  
     titanium geothermometry  
       biotite 136, 137, 137, 138  
       muscovite 136, 137–138, 137, 138  
     results discussed 139–142  
     summary 142–143, 142  
   setting 130–132  
 Vindhyan Basin 254
- Wangtu Gneissic Complex 114, 321  
 West Dang transfer zone 261  
 West Patna Fault 257  
 western Himalayan syntax belt 21, 21  
 western Himalayan segment 41  
 Western Kunlun Shan Fault (WKSF) 20, 21
- Yadong–Gulu graben 261, 262, 263
- Zanskar Shear Zone (ZSZ) 44  
 zircon dating, HHCS 154, 156, 158, **159**, 160, 161, 162,  
   163, 165  
 zircon fission track thermochronology  
   method 96–97  
   results 97, 98, 99