

Index

Note: Tables are indicated by **bold** page references. Figures are indicated by *italicized* page references.

a

`a`a 74, 75, 98
 achondrite meteorite 439
 aerial fuels 376
 aerosols 200
 aftershocks 130–131
 agricultural productivity 338
 airbursts and impact hazards 440–444
 air masses and fronts 212–213
 albedo 217, 319, 321–322
Alexandrium fundiyense 414
 alluvial fans 169, 263
 alpine glaciers 367
 alternative fuels 358
 altocumulus 204
 Andes 46
 andesite 70
 andesitic rocks 70
 anemometer 204
 Aniakhach Caldera, 94
 Annual Greenhouse Gas Inventory (AGGI) 314
 Antarctic Ice Sheet 344, 345
 anthrax 412
 anthropogenic global warming 349
 anthropological disasters 7
 antibiotic overuse prevention 426–427
 antibiotic resistance 421
 anticyclones 211
 archaea 404–405
 artificial sequestration 361
Ascaris lumbricoides 399
 Asteroid Impact and Deflection Assessment (AIDA) 458

asteroids 436
 asthenosphere 39, 55
 Atlantic tropical cyclones **292**
 atmosphere 412–414
 atmospheric blocking 226, 253
 atmospheric pressure 199
 Automated Surface Observation Systems (ASOS) 203

b

Bacillus anthracis 412
 background noise 110
 bacteria 405–406
 barometer 204, 206
 basal cavity 345
 basalt 66, 70
 basalt blocks 78
 basaltic lava flows 74
 base flow 261, 278
 base isolation 140, 141, 141
 Bermuda High 295
 Bhola Cyclone 290, 298
 Big Thompson Canyon Flood 23, 267
 biogeochemical cycle 359
 biological carbon cycle 359–361
 biological hazards 429–431
 biological disasters 393–397
 climate change 420
 data availability statement 431
 diseases in food supply 422–423
 evolution of organisms 420–422
 global travel 419–420
 hygiene and sanitation 417–418

biological hazards (*cont'd*)
 microbes 397–398
 microbes and the earth system 411–415
 mitigation of hazards 423–428
 population density 415–416
 population diversity 416–417
 population vulnerability 415
 poverty 418–419
 types of microbes 398–411
 biosphere 5
 blast deflection 458
 body waves 111
Borrelia burgdorferi 416, 417
 Boxing Day
 earthquake 154
 tsunami 150
 brain eating amoeba 430
 bread crust bomb 78
 BSE 410–411
 buboes 406
 “bubonic plague” 406

C

Caldera Lake 79
 calderas 78, 79, 80
 Camp Fire 369–372, 387
Candida albicans 403
 Canyon Diablo meteorites 452
 carbon capture and storage 361–362
 carbon capture technology 361
 carbon cycle
 carbon capture and storage 361–362
 deep ocean storage 362
 iron fertilization of ocean 362–363
 mirrors 363
 sun and/or brightening earth 363
 carbon dioxide 76, 366
 carbon footprint 356
 carbon sequestration 359–361
 carbon sinks 359
 Carrington Event 459, 465
 Cascadia earthquake and tsunami 153–154
 Cascadia Subduction Zone 154
 Cassini crater 442, 444
 cataclysmic eruption 163
 catastrophe, history of 434–435
 asteroids 436
 comets 436–438
 meteorites 438–444
 near earth objects (NEOs) 444–445
 Centers for Disease Control (CDC) 406, 407
 Cerro Grande Fire 384
 Chelyabinsk 433–434
chemolithotrophs 411, 430
 chemosynthesis 41
 chemosynthetic bacteria 41
 chestnut blight 404
 Chicxulub Crater 455
 childhood polio 419
 chlorine 76
 chlorofluorocarbons (CFCs) 314
 cholera 417
 chondrules 439
 chronic wasting disease (CWD) 428
 cinder cones 76, 77, 79–83
 cinders 76
 climate change 7, 313, 366–367, 372, 387, 420
 adaptation 363–365
 climate *versus* weather 310
 CO₂ 330–334
 data availability statement 367
 Earth 310–313
 Earth’s temperatures 319–324, 328–330
 geoengineering 361–363
 greenhouse effect 314–318, 324–327
 greenhouse gas emissions and 334–351
 greenhouse gases 314
 mitigation of hazards 356–361
 ocean impacts
 coral bleaching 351–352
 distribution, current status, and
 projections 356
 El Niño and La Niña 354–356
 great ocean conveyor belt 353–354
 ocean acidification 352–353
 projected average global temperatures 334
 slushballs and greenhouses 307–309
 climate disasters 335–337
 climate feedback 330
 climate resilient development 313
Clostridium tetani 413
 cloud-to-ground lightning 241
 coastal communities 138, 140
 coastal floods 272–273

cold air 212
 cold front 212
 collision zones 45, 48–49, 55
 Columbia River basalts 78, 79
 combustion 372–374
 comets 436–438
 Community Development Block Grant Disaster
 Recovery Program 285
 community response 21–25
 complex crater 450
 composite cones 83, 98
 composite volcano 83, 99
 Comprehensive Nuclear Test Ban Treaty 118,
 120, 142, 143
 compressional waves 111
 conduction 374
 conflict disaster 7
 continental air masses 212
 continental crust 38
 continental drift 31–35
 continental lithosphere 64
 continental-oceanic subduction zones 45–47, 65
 continental rifting 43, 44
 continental rifts 41, 66
 convection 39, 212, 219, 374
 convection cells 212
 convergent boundaries 40, 45, 55
 convergent plate boundaries 45
 coral bleaching 351, 351–352
 Cordillera Blanca 136
 core 38
 Coriolis effect 207–211, 211, 216, 218, 288,
 305, 353
 coronal mass ejections 464
 Coronal Mass Ejections (CMEs) 461, 462
 cosmic dust 6
 COVID-19 case study 393–397
 Crater Lake 81
 cratons 438, 442
 creep 173, 173–174
 Cretaceous extinction 453–456
 Creutzfeldt-Jacobs disease (CJD) 410–411
 crown fires 376
 crust 38
 culling 428
 cultural burning 383
 cumulonimbus clouds 204

cumulus clouds 204
 cut bank 264
 cyanobacteria 397, 397
 cyclonic rotation 216, 218
Cynognathus, 33

d

dam failure 136–137
 data availability statement 56, 99, 144, 168, 194,
 431, 465
 debris flows 170, 171, 181–183
 Deep-Ocean Assessment and Reporting of
 Tsunamis (DART) 166
 deep ocean storage 362
 derechos 242–243
 dewatering 189
 dew point 204
 differentiation 435
 Dimorphos 458
 diorite 70
 disaster subculture 23
 discharge 260, 261
 disease-causing pathogens 429
 divergent boundaries 40–45, 42, 55
 divides 258
 Doppler effect 206
 Doppler radar 247
 Doppler weather radar 206, 207, 218
 Double Asteroid Redirection Test (DART) 458
 downbursts 242
 drainage basin 258, 278
 drought 227–230, 253, 337–343
 dry land ecosystems 361
 dwarf planet 436

e

Earth
 atmosphere 197–199
 future 463
 interior heat 326
 natural systems 365
 structure 38–40
 temperatures 319–324, 328–330
 warming 310–313
 Earth movements 193
 data availability statement 194

Earth movements (*cont'd*)

- mass-wasting triggers 188
- mitigation of hazards 188–192
- role of gravity 169
- types of 172–188
- Venezuela 169–172
- earthquake-generated tsunamis 160–161
 - Cascadia earthquake and tsunami 153–154
 - Cascadia Subduction Zone 154
 - Indonesia earthquake and tsunami 154–157
 - Tohoku earthquake and tsunami 157–160
- earthquakes 101–111, 123–125, 142–144
 - data availability statement 144
 - hazards 129–138
 - mitigation strategies, 139, 139–141
 - Prince William Sound Earthquake 138–139
 - seismic waves 111–123
 - types of faults 126–129

Earth System 4–7, 6, 411–415

Eastern North Pacific Cyclones **292**

Ebola virus 407

eccentricity 328

elastic rebound 125

electromagnetic radiation 217

electromagnetic spectrum 199, 200, 217

elite controllers 416

El Niño and La Niña 354–356

El Niño Southern Oscillation (ENSO) 354

endemic 399

Enhanced Fujita (EF) Scale 247, 247, **248**, 277

epicenter of earthquake 109

epidemic 399, 429

eukaryotes 404

extraterrestrial hazards 6

extratropical cyclones 212

extreme weather 349

f

“famine relief tax” 20

Farallon Plate 50

faults

- scarp 108
- types of 126–129

FEMA 285

Ferrel cells 208, 209

fire 133

fireball 434

fire basics 372–375

fire behavior 375–382

fuels 376–377

topography 381–382

triangle 375

weather 377–381

firebrands 388

firefighting in public lands 382–386

fire hazards, mitigation of 386–387

fire triangle 375, 388

fire whirl 379

First Law of Thermodynamics 319

fissures 57, 58, 76

eruption, 58

flash 265–268

flash floods 243

flesh-eating bacteria 430

floodplains 257, 265, 279

floods 279

basalts 78

central China 255–258

coastal floods 272–273

control technology 15

flash 265–268

frequency curves 262

frequency diagrams 279

inland flooding 273–274

mitigation 274–278

nature of streams 258–265

probability 261–263

river 268–271

storm surge 271–272

flow 183

Flu Mist vaccine 421

fluorine gas 76

Foehn winds 379

food safety 424

food supply

- diseases in 422–423

forecasting 9

fossil fuels 360

fracture zones 51

free-living protozoans 429

frontal winds 378

fronts 219
 fuels 376
 continuity 377
 load 377
 fungal diseases 403
 fungi 402–404
 fusion 435

g

gabbro 70
 gabion 191, 194
 Garlock Fault 127
 geoengineered sequestration 361
 geoengineering 361–363
 geological sequestration 361
 geomagnetic storms 462
 geophysical modeling 38
 geotechnical survey 189
 glacial maxima 307
 glacial period or ice age 365
 Glacier National Park 343, 344
 Global Alliance for Vaccines and Immunization (GAVI) 425
 global carbon cycle 359
 global climate change 310
 global dimming 325
 global mean sea level rise (GMSL) 346
 global travel 419–420
 global warming 310
 Global Warming Potential (GWP) 314
Glossopteris, 32
 gradient 259
 granite 70
 gravity
 role of 169
 tractor 458
 winds 379
 Great Barrier Reef 352
 Great Depression 227
 great earthquakes 128
 Great Ocean Conveyor Belt 353–354, 367
 greenhouse effect 202, 218, 314–318, 317, 318, 324–327, 365
 greenhouse gas emissions 313, 334–351, 359
 greenhouse gases 202, 314, 315, **316**, 317, 322–325, 334, 337

greenhouses 307–309
 Greenwich Mean Time 202
 ground fuels 376
 ground motion, amplification of 133–134

h

Hadley cells 208, 209, 218
 hail 243–244
 hailshaft 244
 hailstreak 244
 Hawaiian-Emperor chain 52
 Hawaiian Hotspot 53
 Hawaiian Volcano Observatory 62, 94
 hazards
 mitigation of 188–192
 headwaters 259
 heat exhaustion 227
 heat flow 51
 heat illnesses 227
 heat index 206, 206, 218
 heat transfer 374–375
 heat waves 225–227, 252, 337
 heavy fuels 376
 heavy rains 295–298
 Hebgen Lake earthquake 177
 high nutrient, low chlorophyll (HNLC) 362
 high pressure systems 214–216
 high winds 303
 Hilina Fault System, 109
 hookworm 400
 horizontal wind shear 246
 hotspots 40, 51–54
 Housing and Urban Development (HUD) 285
 Hunga-Tonga eruption 150
 Hurricane Allen 293
 Hurricane Harvey 274, 296, 297, 298, 304
 Hurricane Ike 298, 299, 300
 Hurricane Irma 282, 284
 Hurricane Katrina 294, 299–303, 301, 302, 304
 Hurricane Lane 289
 Hurricane Maria 281–287
 Hurricane Michael 303
 Hurricane Pam 276
 hurricanes 305–306
 hazards 295–303
 Hurricane Maria 281–287

hurricanes (*cont'd*)
 mitigation 304
 tropical cyclones 287–295
 Hurricane Sandy 294, 296, 300
 Hurricane Wilma 293
 hydrofluorocarbons (HFCs) 314
 hydrogen sulfide 76
 hydrographs 261
 hydrosphere 4, 414–415
 hydrothermal vents 41
 hygiene 417–418, 424
 hypocenter 109
 hypothetical watershed 258

i

ice shelves 345
 ice wedging 169, 176
 idealized severe thunderstorm 237
 igneous rocks 66, 98
 impact craters 449–453
 impactors/bolides 463
 Incorporated Research Institutions for
 Seismology (IRIS) 13
 Indonesia earthquake and tsunami 154–157
 infectious molecules 409–410, 430
 Influenza A viruses 421
 infrared radiation 199
 infrasound monitoring 96, 97
 inland flooding 273–274, 295–298
 insect ranges 349–351
 intensity scale 117
 interglacial periods 307
 Intergovernmental Panel on Climate Change
 (IPCC) 311, 313
 intermittent stream 265
 International Red Cross 19
 international relief organizations 228
 interspecies diversity 416
 Intertropical Convergence Zone (ITCZ) 208, 209,
 211, 287
 intraplate earthquakes 128
 inundation zone 153
 invasive fungal diseases 403
 Iron Enrichment Experiment (IRONEX) 362
 iron fertilization of ocean 362–363

iron meteorites 439
 island arc 64, 65

j

Jet Propulsion Laboratory (JPL) 448
 jet stream 210
 Johnstown Flood 265

k

Karenia brevis 414
 karst 185, 187
 kinetic energy 124, 434
 kinetic impactor method 457–458, 464
Klebsiella pneumoniae 422
 K-rails 191
 Krakatoa's summit 163

l

ladder fuels 376
 lahars 89
 landslide-generated tsunamis 161, 167
 landslides and other earth movements 135–136
 land-use zoning 99
 La Niña event 366
 lava dome 90, 91
 lava flows 98
 lava tubes 75, 76
Legionella pneumophila 414
Leishmania 402
 leishmaniasis 401–402
 lengthy eruption 57–64
 Lesser Antilles 47
 light fuels 376
 lightning 239–241
 liquefaction 134–135, 135
Listeria monocytogenes 415
 lithosphere 4, 39
 Little Ice Age 343
 local magnitude 117
 Loma Prieta earthquake 105
 Louisiana Strategic Adaptations for Future
 Environments (LA SAFE) 364
 love wave 112
 low-amplitude tsunamis 166

low pressure systems 214–216

Lystrosaurus 33

m

macrobursts 242, 242

magma 46, 97, 98

eruption of 66–70

magma generation 64–70

magnetism 35–37

Magnitude Scale 117

mantle 38

mass wasting 188, 192, 193

Mayon Volcano 93

meandering stream 264

meanders 264, 279

medium fuels 376

mega-tsunamis 161, 168

melting cryosphere 343–344

melting permafrost 349

mesopause 199

Mesosaurus 33

mesoscale convective complex 235

mesosphere 39, 55, 197, 217

meteor 438

Meteor Crater 452, 452, 453, 457

meteorites 438–444, 463

meteoroids 438

meteotsunamis 150

methanogenesis 359

Methanosarcina, 405

methanotrophy 359

microbes 397–398, 411–415

types of 398–411

microbially induced corrosion (MIC) 411

Mid-Atlantic Ridge 41, 55

Middle Eastern Respiratory Syndrome
(MERS) 395

midocean ridges 41, 42

Milankovitch cycles 325

mild winter storms 230

mineral carbonation 362

mineral soil 375

mine tailings 411

mirrors 363

Mississippi River Delta region 276

Mississippi River watershed 259

mitigation 9, 96–97, 274–278, 304

strategies 139–141, 190

modified mercalli intensity scale **118**

Modified Mercalli Intensity Scale 118

Moenkopi Formation 452

moment magnitude 117

Montreal Protocol 314

Mount St. Helens, case of 83–90

mRNA vaccines 396

mud flows 89

multicellular parasites 399–400

mycorrhizae 403

Myxomavirus 409

n

Naegleria fowleri 415

National Flood Insurance Program 275

National Oceanographic and Atmospheric
Administration's (NOAA) 149,
265, 314, 462

national public safety marketing
campaign 268

National Resource Conservation Service
(NRCS) 228

National Weather Service (NWS) 8, 202, 239

natural disasters 1–4, 8, 9–13

community response 21–25

definitions 8–9

earth system 4–7

human factor 13–14

risk 14–18

role of government 18–20

and social change 21

types of disasters 7–8

natural event 8

Near Earth Asteroid (NEA) 445

near earth objects (NEOs) 444–445

negative leader 241

NEOSshield program 457

Nevado del Ruiz 92

New Madrid Fault Zone 128

nitrogen-fixing bacteria 430

NOAA Space Weather Scale 462

nomogram 116, 116

normal fault 127

North Anatolian Fault 12, 127

Northeast Power Coordinating Council, Inc.
(NPCC) 463
nuclear testing site 120

O

observed collisions 445–449
obsidian 66
ocean acidification 352–353
ocean-floor seismometers 120
ocean floor topography 153
oceanic lithosphere 64
oceanic-oceanic subduction zone 47–48, 65
ocean impacts
 coral bleaching 351–352
 distribution, current status, and
 projections 356
 El Niño and La Niña 354–356
 great ocean conveyor belt 353–354
 ocean acidification 352–353
Online Etymology Dictionary 281
orchids 429
organisms, evolution of 420–422
“orphan” tsunami 153
outbreak 399
overriding plate 45

P

Pacific Tsunami Warning Center 149, 165
paleoclimatology 32
paleomagnetism 36
Palmer Drought Index 229
Pangaea, 32
Paris Agreement 334, 356, 358
pathogen 398–399
Pele’s hair 62
Penicillium chrysogenum 422
Penicillium commune 422
permafrost 174
Permian mass extinction 405
phage therapy 427
phaneritic 69
phenology 343
pāhoehoe 74, 98
photosynthesis 41, 373
Phytophthora infestans 423
pillow lavas 43, 43
pit craters 79

plague epidemics 406–407
planetary air circulation patterns 207–211
Planetary Defense Coordination Office
 (PDCO) 456
planetary temperature model 327
planetesimals 435
Plasmodium 398, 416, 420
plate boundaries 40–45
plate tectonics 51, 54, 56
 collision zones 48–49
 continental drift 31–35
 data availability statement 56
 earth structure 38–40
 hotspots 51–54
 magnetism 35–37
 plate boundaries 40–45
 seafloor spreading 38
 subduction zones 45–48
 theory 39, 40
 transform boundaries 49–51
Pleistocene epoch 328
Plinian column 88
Plinian-style eruption 89
plutonic igneous rocks 69
plutonic rocks 71
Pneumocystis 415
point bars 264
polar amplification 311, 311
Polar cells 209
polar front 211
polar jet stream 209
polar vortex 232–234, 233
polio epidemics, 419
polio vaccine 419
population density 415–416
population diversity 416–417
population vulnerability 415
post-traumatic stress disorder (PTSD) 24
potential energy 123
poverty 418–419
poverty-related diseases (PRDs) 418
Prairie States Forestry Project 228
precautionary principle 363
precession 328
preignition/preheating 374
prescribed fires 384
prescribed natural fires 383

primary amoebic meningoencephalitis
 (PAM) 415, 430
 Prince William Sound Earthquake 138–139
 prions 409–410
Prochlorococcus 397
 proposals 458
 protostellar disk 435
 protozoans 400–401, 429
 Psychological First Aid (PFA) 24, 25, 27
 psychrometer 203
 public lands, firefighting in 382–386
 puffy clouds 204
 pumice 69
 Puna Geothermal Venture 62
 P waves 111, 111, 112, 113, 143
 pyroclastic flows 16, 72, 89, 94, 163
 pyrolysis 374

q

quarantine 427

r

rabbit myxomavirus 408–409
 radiant heat absorption 322–324
 radiation 374
 Rayleigh waves 112, 130
 recurrence interval 261–263
 Red Flag Days 8
 regional wind patterns 379
 regolith 169
 relative humidity 203
 renewable energy 358
 “retrograde elliptical” motion 112
 return stroke 241
 reverse fault 128
 rhyolite 70
 rhyolitic 70
 Richter Scale 115–117
Rickettsia prowasekii 416
 rift zones 76
 Rio Grande Rift 66
 risk 9
 measuring 445–456
 river 268–271
 floods 268
 rock bolts 191
 rock diorite 70

rock fall 174
 Rossby wave 232, 233
 rotational slide 179, 180
 Royal Gardens 59
 “rubble pile” asteroid 438
 run-up of tsunami 153, 167

s

Saffir-Simpson Hurricane Wind Scale 291, **293**
 Saffir-Simpson scale 305
 saltwater incursion 347
 San Andreas Fault 50, 50, 51, 51
 sand blow 134
 sanitation 417–418, 423
 scoria 76
 Scotch Cap Lighthouse 145, 146, 148
 seafloor spreading 38, 41
 sea level rise 344–349
 sedimentary rock 452
 seiches 137–138, 144
 seismic energy 38, 109
 seismic waves 38–39, 109, 111, 111–123
 seismograms 110, 115
 seismology 120, 142
 additional capabilities of 118–123
 seismometers 96, 104, 109, 110, 110, 112, 116, 143
 “septicemic plague” 406
 Severe Acute Respiratory Syndrome
 (SARS) 395, 430
 severe weather
 blizzard on plains 221–225
 events 225–251
 ShakeMaps 118, 132
 shear walls 139
 shear waves 112
 shield volcano 57, 72–79, 98
 shocked quartz 449
 short-term climate variations 366
 Shotcrete 191, 191
 Sinabung 97
 sink 359
 sinkholes 185
 slides 175–179
 slumps 179–180, 180
 slushballs 307–309
 small-scale flooding 255
 snow avalanches 192

Snowball Earth 307
 solar events 459–463
 solar flares 461, 464
 solar radiation 199–202, 217
 solar wind 435
 solid earth (geosphere) 411–412
 solifluction 174, 175
 Southeast Regional Carbon Sequestration
 Partnership (SECARB) 361
 space hazards 464
 blast deflection 458
 Chelyabinsk 433–434
 data availability statement 465
 earth's future 463
 gravity tractor 458
 history of catastrophe 434–445
 kinetic impactor 457–458
 measuring risk 445–456
 proposals 458
 solar events 459–463
 Space Weather Prediction Center 462
 spike protein 396
 spillover 407
 spillover event 395
 spindle bomb 78
 spore-forming bacteria 412
 spotting 375, 388
 squall line 235, 235
 Steelhead Haven 181
 stony-iron meteorites 439
 stony meteorites 439
 storm surge 271–272, 298–299
 barriers 364
 strain 123
 stratopause 197, 217
 stratosphere 197
 stratovolcanoes 83, 98
 stream parameters 259–261
 streams, nature of 258–265
 stream shapes 263–265
 stream's headwaters 278
 strike slip fault 127
 structure collapse 131–133
 subducted plate 45
 subduction zones 45–48, 55, 128
 sublimation 436
 subsidence 183–188

subtropical jet stream 209
 sulfur dioxide emissions 86
 sun
 anatomy 459–463
 and/or brightening earth 363
 role of 459
 superbolide 434
 superbugs 427
 supercell thunderstorms 235, 246
 surface fuels 376
 surface wave 112
 surface-wave magnitudes 117
 S waves 111, 111, 112, 113, 143
 symbiotic fungi 403

t

talus 175
 talus slope 175
 technological disasters 7
 tectonic plates 4, 55
 temperature anomaly 310
 texture 66
T. gondii 401
 Thera 164
Thermoacidophile archaea 404
 thermohaline circulation 353
 thermosphere 199
 thrust fault 128
 thunderstorm hazards 234, 234–239, 253
 derechos 242–243
 downbursts 242
 flash floods 243
 hail 243–244
 lightning 239–241
 tornadoes 244–250
 tornado safety 250–251
 tidal waves 145
 tiebacks 190
 tipping point 330
 Tohoku earthquake and tsunami 157–160
 tomography 122
 topography 381–382, 388
Torino Scale 445, 446, **446–447**, 464
 tornado alley 246
 tornadoes 244–250, 303
 tornado safety 250–251
Toxoplasma gondii 401

- transform boundaries 40, 49, 49, 50
- trenches 47
- tributary 259
- Tri-State tornado 250
- tropical air masses 212
- tropical cyclones 212, 281, 287–295, 291, 305, 349
 - formation 287–290
 - life cycle of 290–293
- tropical depression 290, 291
- tropical disturbance 290
- tropical storm 291
- tropopause 197, 217
- troposphere 208
- tsunamis 46, 137–138, 144, 167
 - bore 153
 - case studies 153–161
 - data availability statement 168
 - energy 166
 - hazards, mitigation of 164–166
 - landslide-generated 161
 - mega-tsunamis 161
 - run-ups **156**
 - Unimak Island Earthquake and 145–149
 - volcano-generated 161–164
 - warning systems 165
 - wave characteristics 150–152
 - wave creation 149–150
 - wave parameters 152–153
- twenty-first century megadrought 342
- typhoons 288

u

- ultraviolet B (UVB) radiation 201
- ultraviolet radiation 199, 218
- U.N. Framework Convention on Climate Change (UNFCCC) 313
- Unimak Island Earthquake 145–149
- United Nations Framework Convention on Climate Change 356
- United Nations (U.N.) General Assembly 313
- U.S. Drought 229
- U.S. electrical code 286
- U.S. National Climate Assessment 349

v

- vaccinations 396–397, 424–425
- Variola virus* 425
- vector 398
 - control 426
- Venezuela 169–172
- vesicular basalt 69
- Vibrio vulnificus* 420
- viral vector vaccine 396
- viroids 409–410, 430
- viruses 407–408
- volatile organic compounds (VOCs) 317
- volcanic arc 64
- volcanic ash 72, 90, 91, 91, 99
- volcanic eruptions 2, 46, 149
- Volcanic Explosivity Index 4, 5
- volcanic fields 82
- volcanic gases 57, 78, 98
- volcanic rocks 71
 - obsidian 69
- volcanic tsunamis 167
- volcanoes
 - behavior 70–72
 - case of Mount St. Helens 83–90
 - data availability statement 99
 - hazards of composite 90–95
 - lengthy eruption 57–64
 - magma generation 64–70
 - mitigation 96–97
 - types of 72–83
- Volcano Explosivity Index 4
- volcano-generated tsunamis 161–164
- Vredefort 451, 451

w

- wall cloud 247
- warm air 212
- Washington Monument 128
- waterborne pathogens 414, 430
- water movement 151
- water restrictions 365
- water scarcity 341
- watershed 258
- wave base 151, 152
- wave characteristics 150–152
- wave creation 149–150
- wave parameters 152–153
- weather 197, 377–381
 - measurements 202–207
 - planetary air circulation patterns and coriolis effect 207–211
 - surface circulation of atmosphere 211–212

- weather forecasting methods 304
- Widmanstatten patterns 439
- wildland fires 372, 386–388
 - Camp Fire 369–372
 - fire basics 372–375
 - fire behavior 375–382
 - firefighting in public lands 382–386
 - mitigation of fire hazards 386–387
- wildland fuels 377
- wildland/urban interface 372
- Winchcombe meteorite 448
- wind chill chart 206, 207
- wind-drive wave motion 151, 152
- wind speed variations 294–295
- winter storms 230–232, 253
- winter weather 251
- World Bank 401
- World Health Organization (WHO) 393, 395, 401, 407, 423, 425

y

- Yellowstone ash 95
- Yellowstone National Park 383, 384, 385
- Yellowstone Volcano 53, 95
- Yersinia pestis* 406, 407

