Cambridge University Press
978-0-521-76428-5 - Physical Geography: Great Systems and Global Environments
William M. Marsh and Martin M. Kaufman
Index
More information

Index

A

Ablation, glaciers 593, 594
Abrasion
  glacial 595, 596
  wind 620
Absolute humidity 115
Absolute zero 48, 49
Absorption
  atmospheric 182
  solar radiation 60, 61, 62
Abyssal plains 206, 442, 443
Accretion
  microplates 460
  planetary 412
Accretionary wedge 447, 452, 454
Accumulation, glaciers 593, 594
Acidity, soil 305
A climates 161, A2
Active coastlines 575, 576
Active layer 318, 398, 521, 606
Adiabatic lapse rate 117
Adiabatic wind 123
Adobe 164
Adsorption, soil 305
Advection 69, 116
Aerial zone 203
Aerosols 181, 495, 615
  and climate change 629
Afar Triangle 456
Africa
  early humans 268
  landforms 8
African bee, introduction to South America 279
African Plate 450
Aftershocks 481
Aggradation 537
Agriculture 19
  cultural biosphere 206
  early
    diffusion 277
    effect on biogeography 278
    effect on hydrologic system 352
    origin and development 177, 272
    post-World War II 287
    spread of ideas 277
  ecosystems and productivity 224
  effect of global warming 195
  effect on soil 295, 297, 318, 503, 518
  energy pyramid 215
  grasslands 257
  groundwater pollution 393
  shifting 323
  soil and land use 329
  water use 404, 405
Air 58
  heat transfer 69
  volumetric heat capacity 70
Air flow 84
Airflow, surface 614
Air masses, cyclonic precipitation 128
Air-mass thunderstorms 126
Air pressure 84, 85, 90
  See also High pressure; Low pressure
Air temperature 49, 72
Alaska, 1964 earthquake 484
Albedo 62, 629
  and net solar radiation 67
  and urban development 67
  global 66
Albic soil horizon 316, 323
Aleutian Islands 449, 451
Alfisols 320, 322, 323
al-Idrisi, Muhammad (c.1100-66), maps 16
Alien species, introduction by man 237, 241, 253, 279, 463
Alkalinity, soil 305
Alluvial deposits 535
Alluvial fan 517, 542
Alluvial plain 542
Alluvium 297, 389
  soil-forming regime 321, 322
Alpine glaciers 589, 590
  debris transport 596
  erosion 596
  movement 592
Alpine meadow 258, 260
Altocumulus clouds 132
Altostratus clouds 132
Aluminum. *See* Bauxite
Amazon Basin
  climate 161
  cloud cover 66
  flooding 250
  Saharan sediment 530, 629
  tropical rainforest, deforestation 250
Amazon River
  average discharge 341
  sediment output 544
  stream system 530
  triple-junction origin 456
Amazon watershed 377, 378, 544, 545
  formation 549
Ambient atmospheric lapse rate 117, 118, 120
American Western Surveys 550
America, South 489
Amphibians 242
Amphibole 427
Amplitude 482
Amur River, watershed 378, 379
Ancient civilizations
  agriculture 272
  soil 327
Andesite 429, 452
Andes Mountains
  climate 162
  creation 6, 452
Andisols 320, 321, 322
and migration of Homo sapiens 280
Angiosperms 233
  life cycle 238
Angular momentum, conservation of 88, 126
Animals 202
  alien species 253
  and climate 244
  and geographic barriers 245
  and landscape 241
  domestication 274
  ectothermic 242
  endemic 245
  endothermic 242
  global dispersal 244
  major groups 240
  migration 243
  mobility 244
  thermoregulation 242
  wanderers 244, 246
Anions, soil 304
Annualism 235
Anopheles 241
Antarctica
  albedo 66
  Dry Valleys 589
  effect of global warming 194
  katabatic wind 124
  thermal regime 77
Antarctic Circle 23
Antarctic ice cap 17, 340, 589
  movement 592
  oxygen isotopes 173
Antarctic zone 24
Antecedent stream 548
Anthracite 431
Anthrosystem 268
Anticline 478
Anticyclones 86, 91
Antitradewinds 96, 97
Aphelion 42, 43
Appalachian coal field 431
Appalachian Mountains, 469, 460
Aqueducts 354, 385, 392
Aquicludes 390
Aquifers 343, 344, 387
  consolidated 389
  depletion 391
  materials 388
  pollution 392
  types 389
  unconsolidated 389
Arabian Desert, climate 162
Arabian Sea, summer monsoon 95
Aral Sea 399
  water diversion 353, 400, 407
Archeology
  climate-change indicator 174, 177
  early humans 269
Arc islands 444, 449, 451, 457, 458
Arctic air masses 128
Arctic Circle 23
  day length 65
Arctic climate 163, A8
Arctic ice cap 17
Arctic meadow grass 258
Arctic Ocean
  Ice Age 604
  submarine permafrost 606
Arctic tern, migration 243
Arctic, thermal regime 77
Arctic zone 24
  soil-forming regimes 325, 326
Arcuate deltas 579

© in this web service Cambridge University Press

CAMBRIDGE

Cambridge University Press
978-0-521-76428-5 - Physical Geography: Great Systems and Global Environments
William M. Marsh and Martin M. Kaufman
Index
More information

Arêtes 597, 598
Argillic soil horizon 323
Arid hydrologic regime 348
Aridisols 320, 322
Arid soil-forming regime 315, 322
Arid soil-water regime 303
Arithmetic scale 25
Artesian flow 390
Arthropods 242
Ascension Island 444, 446
Asia
early humans 270
south
climate 7
landscape, human influence 12
Asphalt, effect on climate 186
Assyrian civilization, salinization 352
Asteroid Belt 415
Asteroids, collision with Earth 29, 175, 261, 415
Asthenosphere 422, 425
Astrolabe 15
Astronomical unit 42
Atacama Desert 257, 389
Atlantic Basin 443, 444
plate tectonics 183
seafloor spreading 444, 446
triple junctions 456
Atlantic Ocean 17
water-vapor precipitation system 530
Atmosphere 2, 3, 83
airflow 614
as radiation buffer 58, 60
composition 58
cooling 6
general circulation 95
effect of global warming 193
heat reservoir 51
heat transfer 69
influence of oceans 106
influence on hydrologic cycle 629
influence on soil 629
infrared absorption 182
instability 117
interference 60
mobility 84
planets 413
processes 8
transparency 181
water 59
water content 337
water cycle 3, 4, 59
water-vapor precipitation system 114
Atmospheric boundary layer 91, 614, 615
sediment transport 616
Atmospheric circulation, global warming 193
Aurora 37
Aurora Borealis 37
Australia
animals 245
Australian Desert, climate 162
Automated Surface Observing Sites 49
Automobiles, and environment 286
Autumnal equinox 45
Awash river, triple junction 456
Axial plane 477
Axial tilt 44, 45, 180
Axis, of Earth 44, 45, 180

B

Backing wind shift 133
Back-island basins 451
Backshore slope 570
Back-swamps 542, 543
Backwash 571
Bacteria
chemosynthesizing 205, 207
denitrifying 212
nitrogen-fixing 218
soil 299
Badlands 517
Baltic Sea, isostatic rebound 578
Bandaka Glacier 33
Bangladesh
hurricanes 140
sea level rise 195
tornado 142
Bank erosion 569
Bank-full discharge 540
Bank-full stage 372
Barchans 625
Bark 232
Barley, early agriculture 273
Barrier dunes 626
Barrier islands 579
Barriers
animals 245
early humans 270
plants 236
Bar scale 25
Bar, unit of force 85, A1
Basal sliding, glaciers 592
Basalt 428, 429
flood 489
Basaltic rock 417, 427
Baseflow 361, 365, 531
Base level 541
Basepool 395
Bases, nutrient 305, 316
Basin and Range province 470, 461
Basins 477
See also Back-island basins; Forearc basins; Groundwater basins; Marginal basins; Ocean basins
Batholiths 461
Bauxite 512
Bay-head bar 574
Bay-mouth bar 574
B climates 161, A4
Beach 570
Beach drift 571
Beam radiation 62
Beavers, effect on landscape 241
Bed load 535, 571
movement 535
Bedrock
aquifers 389
grooves 623
weathering 297
Bed shear stress 533, 535, 539
meanders 539
Benthic zone 205, 206
Bergeron process 120
Bering Sea, back-island basin 451
Bering Strait, land bridge 245, 271
Berm 570
Bifurcation ratio 369
Big blue stem grass. *See* Blue stem grass
Biochemical systems, soil 304
Bioclimatic zones
and weathering 509
soil-formation regimes 315
Biogeochemical cycles 209
Biogeography 231
effects of early agriculture 278
Biological cycle, processes 8
Biological weathering 511, 514
Biomass
animals 240
plants 203
Biomes 246
and productivity 247
biomass and precipitation 247
desert 257
forest 247, 248
savanna 255
tundra 258
Biosphere 2, 201
as landscape mediator 204
cultural 201
disturbances to 206
ecosystems 207
oceanic 205
terrestrial 203
Biota 207
distributional change 261
disturbance 261
geographic patterns 246
Biotite 427
Birdfoot deltas 579
Birds 242
migration 243
Bison 257
Bituminous coal 431
Black Death 177
Black grama grass 257
Blizzards, as hazard 143
Block-faulted mountains 473
Blowouts 626
Blue Ridge province 469, 470
Blue stem grass 257
root system 308
Body waves 481
Borax 430
Boreal forests 18, 253
Bottomset beds 546
Boulders, in stream channels 534
Boundary currents 101
Boundary layer 614, 615
sediment transport 616
Boundary-layer friction 91
Bowen ratio 72, 184, 186
Brahmaputra River
average discharge 341
sediment output 544
watershed 378
Braided channels 538
Brazos River, discharge 364
Breaching, meanders 540, 542
Breaking waves 564, 565, 566
Breakwaters 581
Breeze, land-sea 94
Brunisols 325
Buffalo grass 257

C

Cacti 258
Calcic soil horizon 317, 322
Calcium carbonate 430
weathering 511
Caldera 490
See also Megacaldera
California Current 104
California State Water project 354
Calorie 48, A1
Calving, glaciers 594
Canadian Shield, glaciation 598, 602
Canadian Soil Classification System 325
Canary Current 101
Canyons 548
submarine 574
Capillarity, soil 301, 302, 386
Capillary fringe 387

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-0-521-76428-5 - Physical Geography: Great Systems and Global Environments
William M. Marsh and Martin M. Kaufman
Index
More information

Capillary water 301, 308, 345, 386
Carbonate minerals 426
Carbonate platforms 580
Carbonation 511
Carbon cycle 3, 210
Carbon dioxide
and climate change 6, 46, 59, 175, 190, 191
and plant growth 211
and productivity 222, 331
atmospheric 59
effect of soil erosion 331
greenhouse gas 182, 190
in chemical weathering 511
recycling 210
reduction 6, 176
sinks 183, 191, 331
Carbonic acid 511
Caribbean Sea, hurricanes 140
Carnivores 214
Cascade Mountains 448, 454
Caspian Sea, Volga Delta 377
Cation exchange 305
Cations, soil 304
Cattle, domestication 274
Caverns. *See* Caves
Caves 394, 570
Lake Superior 560
See also Karst systems
C climates 162, A6
Celsius scale 49
Centigrade scale. *See* Celsius scale
Central America, climate 161
Central Valley aqueduct system 391, 407
Centrifugal effect 21
Cereals, early agriculture 273
Chaco 256
Channel deposits 535, 542
Channel erosion 534
Channel precipitation 360, 361, 366
Channels
aggradation 537, 543
anastomosing 538
degradation 537, 543
dynamics 540
elevation 543
form 537
and land use 537
streamflow 532
Channel systems 369, 371
flooding 372
Mars 369, 414
obstruction 372
Chaparral 255
Chelation 512
Chemical energy 47
Chemical weathering 507, 511
Chemosynthesis 207
Chernozems 325, 326
Cherrapunji, India, orographic rain 122
Chesapeake Bay, ria 579
China
economic development 192
windborne pollution 98
Chinook wind 123, 618
Chlorofluorocarbons (CFCs) 60
Chloropleth maps 27
Chronometer, John Harrison (1693–1776) 16
Cinder cones 490
Circle of illumination 45
Circulation
ocean, and Ice Age 604
secondary 99
Circulation systems 83, 85
non-rotating Earth 87
rotating Earth 88
Cirques 589, 597, 598
Cirrocumulus clouds 132
Cirrus clouds 131
Cities 1, 2
aerodynamics 188
air temperature 72, 184, 185
climate 185
early 275
Class 233
Clathrates 175
Clay 297, 298, 316
cation-exchange capacity 305
soil-forming regime 318, 324
Cleopatra's Needle, weathering 510
Cliffs. *See* Sea cliffs
Climate
and animal dispersal 244
and humans 163
and runoff 518
dry and stable 158
floristic associations 234
global 148
types A2
influence of mountains 6
Pleistocene 601
use of technology 166
wet and stormy 158
Climate change 171
and dust 629
and plant distribution 239
carbon dioxide 6, 59
causes 179
cities 185
indicators 172
lakes 400
limestone breakdown 6
past 174
regional 190
twenty-first century 190
Climate classification, Köppen–Geiger system 159, A2
Climate systems 148
uncertainty 151
Climate zones 18, 161, A2
See also morphogenetic regions
cold forest 162, A7
Mediterranean 157, A6
middle-latitude belt 19, 155, 159, A5, A6
polar A8
temperate A6
tropical 152, 158, 161, A2
Climax community 262
Closed systems 524
Clothing, adaptation to climate 165
Cloud cover, global 66
Cloud forests 251
Clouds 17, 18, 20, 59, 115
and insolation 60, 66, 182
convectional precipitation 124, 126
funnel 126
hurricanes 136
orographic precipitation 122
precipitation 120
types 131
Venus 18
water cycle 4
Coal 431
formation 300
mining 285
Coastal sand dunes 619, 626
Coastal systems 560
erosion 569, 580
human impact 580
interconnections 562
plate tectonics and development 575
sediment transport 570
time trends 563
Coastlines
active 575, 576
geomorphic systems 560
passive 575, 576, 578
Coasts. *See* Littoral zone
emergent 577
post-glacial uplift 577, 578
rift-margin 577, 578
submergent 578
tectonic 577
volcanic 577
Coefficient of runoff 363, 366
Cold-blooded animals 242
Cold forest climates 162, A7
Cold fronts, cyclones 130, 133
Cold thermal anomalies 107
Cold zones, soil-forming regimes 326
Colloids, soil 305, 306, 316
Colorado Plateau 501, 548, 461
Colorado River
downcutting 461
Hoover Dam 353, 553
reservoirs 353, 553
superposed stream 548, 549
Columbian Exchange 279
Columbia Plateau, flood basalt 489
Columbia River
average discharge 342
dams 286, 553
delta 579
Columbia River Gorge Expedition (1804–1806) 16
Combustion
effect on climate 187
precipitation and heat 188
Comets, as origin of Earth's water 336
Communities 208
Community-succession concept 262
Complex dunes 626
Complex slopes 525
Composite volcanoes 490
Composite wetlands 401, 402
Compressional stress 473
Compressional waves. *See* P-waves
Concave slopes 525
Concrete, effect on climate 186
Condensation 114, 116
and precipitation processes 120
latent heat of 72, 95
Condensation nuclei 120, 182
Conduction
heat transfer 68, 69, 71
mantle 424
Conductivity, hydraulic 386
Cone of depression 391, 392
Conglomerate 430
aquifers 389
Congo Basin
climate 161
drainage 378
flooding 250
Congo River, average discharge 341
Conifers 233, 236
Conservation of energy 47
Conservative plate borders 453
Constrained glaciers 590, 597
Constructive plate borders 451
Continental air masses 128
Continental climate 157, 159, 163, A7, A8
Continental crust 417
rock recycling 435
Continental drift 439

© in this web service Cambridge University Press www.cambridge.org

Continental glaciers 589
debris transport 596
erosion 598
Continental rise 443
Continental shelf 206, 417, 434, 435, 442
productivity 224
sedimentation 431
Continental slope 442
Continental subarctic climate 162, A8
Continental thermal regime 76, 94
Continents
breakup 461
growth 459
hydrologic system 338, 339
major features 442
Continuous permafrost 606
Contour maps 28, A10
Contours 28, A11
Convection
air 117
free 94
heat transfer 68, 69, 71
mantle 424, 434
urban heat island 188
Convectional precipitation 124, 144, 156
Convection cells 125, 127
Convection zone, Sun 36
Convergence
continental–continental 453
oceanic–continental 452
oceanic–oceanic 451
Convergent plate borders 451
Convergent precipitation 122, 134
Convex slopes 525
Conveyor belt, deep ocean 105, 605
Coordinate system, global 21
Copernicus, Nicolaus (1473–1543), heliocentrism 41
Coral reefs 432, 579, 580
effect of global warming 196
guyots 458
productivity 224
Cordilleran orogenic belt 470
Core
Earth 51, 413, 417
seismic velocity 420
structure 421
Sun 36
temperature and pressure 423
Coriolis effect 90, 98, 99
cyclones 133
hurricanes 136
ocean currents 100, 101
Corn Belt, and geographic change in vegetation 240
Corona 36, 37
Corrasion 570
Corridors, fluvial lowlands 548
Cotton clothing 166
Cottongrass 258
Country rock 433
Countryside, depopulation 2
Craters
impact 415
volcanic 490
Cratons 434, 460
Creep 521
glaciers 592
Creep segments, earthquakes 480
Crest slope 516
Crest, wave 564
Croplands 224, 241
and geographic change in vegetation 240
early land clearance 278
prairies 257
soil and land use 330
Crops
domestication 273, 277
effect on soil 295, 297, 318
Crushing, glacial 595, 596
Crust 3, 417
density 418
isostasy 419
rock distribution 434
rock mass balance 434
rocks and minerals 425
temperature and pressure 423
Cryosols 325, 326
Crystallization, magma 426
Cubango River 549
Cultural eutrophication 400
Cultural hearths 273, 275
Cumulonimbus clouds 131
Cumulus cloud 126, 131
Currents. *See* Longshore currents; Ocean currents
Current systems 506, 507, 561, 562
Cycles, earth 3, 4
Cyclogenesis 130
Cyclones 86, 91
Midlatitude zone 99, 128
development and movement 132
storms 20, 93, 98, 151
Cyclonic precipitation 122, 128, 156

D

da Gama, Vasco (c.1469–1524), Indian Ocean navigation 97
Dams 286, 353, 406
and channel form 537
effect on plants and animals 553
impact on stream systems 553
Darcy's law 386, 387, 388
Darkness 45
Davis, William M. (1850–1934), geographic cycle 550
Day
sidereal 43
solar 43
Day length, and latitude 65
Daylight 45
and latitude 65
D climates 162, A7
Debris
glacial 596, 598
hillslope processes 516
Deciduous forests 252
Deciduous habit 236
Decomposers 214
Decomposition, soil 299
Deduction 10
Deep layer 105
Deep-ocean conveyor belt 105, 605
Deflation basins 622
Deflation hollows 620, 622, 626
Deflation, wind 620
Deforestation
and erosion 280, 532
ancient civilizations 327, 328
early agriculture 278, 280
midlatitude rainforests 255
temperate forests 252, 253
tropical rainforest 250
Deformation
plastic, glaciers 590, 592
rock 460
Degassing 210
Degradation 537
Deltas 545
and land-use development 547
arcuate 579
birdfoot 579
estuarine 579
mass-balance systems 546
soil-forming regimes 320
structure 545
submergent coasts 579
Denudation 502
hillslope processes 516
rates and trends 518
weathering processes 508
Deposition 517
glacial 598
landforms 599
longshore
landforms 574
processes 574
stream systems 535
Deposits, glaciofluvial 599
Depression storage 362, 366
Depressions, tropical 135
Desert biomes 257
Desertification 193, 195, 219, 349, 518, 627
Desert lag 622
Desert lakes 396, 399
Deserts
barrier to migration 245
climate 161, A4, A5
denudation rates 518
dry 257
shrub 258
soil-forming regimes 315
Desert sand dunes 625
Destabilizing forces 3
Destructive plate borders 451
Detritivores 214, 250
soil 299
Detroit, microclimate 188
Dew 75, 116
Dew point 116
Diagnostic soil horizons 318, 320
Dicotyledons 233
Differential stress 473
Diffuse radiation 62
Dikes 428
Dinosaurs 175
Diorite 429
Dip 475
Direction
maps 27, A10
Discharge
and sediment transport 536
aquifer 388
bank-full 540
downstream 532
stream 345
streamflow 365
Discontinuous permafrost 606
Disease, spread by insects 241
Dismal River, discharge 394
Dissolved load 535
movement 536
Distributaries 546
Distributional change 261
Disturbance
biota 261
floristic associations 237
low pressure 92, 130, 135, 136
Disturbance theory 262
Divergence, upper-air 130
Divergent plate borders 451
earthquake hazard 487
Diversity, species 234
Dog, domestication 274
Doldrums 95, 338

© in this web service Cambridge University Press

CAMBRIDGE

Cambridge University Press
978-0-521-76428-5 - Physical Geography: Great Systems and Global Environments
William M. Marsh and Martin M. Kaufman
Index
More information

Dolines 512
Dolomite 430
Domes 477
  granite 514
  uplift 549
Domestication
  of animals 274
  of plants 273, 277
Doppler radar, tornado detection 141
Dormancy 235
Dornveld 256
Downbursts 126, 617
Down clothing 165
Downcutting, valleys 541
Downdrafts 126
Downwelling 105
  subduction 447
Drag, bed-load movement 535
Drainage
  Industrial Revolution 284
  wetlands 281
    Dutch engineering 282
Drainage density 370
Drainage divide 367
Drainage networks 369
  and streamflow 370, 382
Drainage systems
  closed 524
  modification by man 280
Dredging 581
Drift
  beach 571
  glacial 297, 389, 599
    lakes 396, 397
  littoral 571
Driving forces, stream systems 531
Drought 195, 348, 627
  and soil capillarity 302
  plant habits 235
Drumlins 600
Dry adiabatic lapse rate 118, 120
Dry climates A4
Dry monsoon A4
Dry Valleys, Antarctica 589
  ventifacts 622
Dune fields 624
Dunes. *See* Sand dunes
Dust Bowl 616, 622, 628
Dust domes 182, 185
Dust, long-distance transportation 304, 530, 615, 629
Dust storms 616
Dwarfism, trees 254, 258
Dynamic balance, aquifers 388
Dynamic equilibrium 47, 388, 506, 551
Dynamic pressure cells 86

E

Earth 43
  See also Core, Crust, Mantle
  axial tilt 44, 45, 180
  biogeochemical cycles 209
  circulation
    non-rotating 87
    rotating 88
  circumference 22
  color 17
  core 51, 413, 417
  crust 417
  cycles 3, 4
  differentiation 413, 417, 418
  energy balance 46, 74
  energy systems 46
  facts 21
  from space 17
  geographically unified 9
  Great Systems 2
    interconnection 9, 532
  insolation 63
  internal heat sources 423
  internal structure and composition 417
  internal system 411
  landmasses 17
    color 18
  magnetic field 421
  orbit 21
    Milankovitch cycles 179
  past climate change 174
  revolution 43
  rotation 21, 43, 90
  shape 21
  surface reflectance 62
  surface temperature 51
  thermal character 50
  water 17
    origin 336
Earthquakes 480
  aftershocks 481
  Alaska (1964) 484
  depth 448
  epicenter 480
  fatalities 488
  focus 480
  Great East Japan (2011) 484
  Haiti (2010) 484, 485
  hazard zones 487
  intensity 484
  magnitude 482
  measurement 481
  Mercalli scale 484
  mid-ocean ridge 444
  Moment magnitude scale 483
  New Madrid, Missouri (1811–1812) 486
  Richter scale 482
  subduction zone 447
Earth systems 4
  balance 5, 46
  budget 5
  ecosystem 207
  energy systems
    internal 423
    radiation and heat 57
  equilibrium 5
  external 6
  feedback 5, 6
  geographic scale 4, 5
  global air and ocean circulation 83
  hierarchical organization 5
  internal 3, 6, 34, 51, 411
  open 4, 47
  water system 335
    See also Great Systems
Earthworms 299, 300
East African Rift System 478
  lakes 398
  plate tectonics 451, 456, 461
East China Sea, marginal ocean basin 576
Easterly waves 99, 135, 136
East Greenland Current 595
Eccentricity 179, 604
E climates 163, A8
Ecosystems 207
  effect of global warming 196
  energy flow 214
  feedback 218
  geothermal-based 207
  productivity 208, 220
  river valleys 260
  soil 298
  solar-based 208, 216
  structure and processes 213
Ectothermy 242
Edwards Formation, springs 395
Egyptian civilization 276
  limestone building 509
Einkorn 273
Ekman spiral 101
Ekman transport 101
Elastic deformation 473
Electromagnetic radiation 39, 69
Electromagnetic spectrum 39
Elements, required by organisms 209
Elephants, effect on landscape 241
Elevation
  and erosion 504, 505
  and precipitation 504, 506
  and temperature 78
El Niño phenomenon 9, 49, 107, 155
Eluviation 307
  soil 306, 316
Emergent coasts 577
Emmer 273
Empirical experience 25
Empty Quarter, Arabian Peninsula
  albedo 66
  megadunes 624
End moraines 599
Endothermy 242
Energy 34
  chemical 47
  Earth's internal system 34, 51, 411, 423
  Earth systems 5, 46
  endogenous 411
  exogenous 411
  geothermal 34, 51
  heat 46, 48
  kinetic 5, 34, 47, 48, 533
  potential 47, 533
  solar 20, 33, 34
  Sun–Earth system 33
  waves 566
Energy attenuation 214
Energy balance 46, 57
  diurnal variation 74
  Earth's surface 74
  ecosystems 218
Energy diffusion, longshore deposition 574
Energy flow, ecosystems 214
Energy pitfall, longshore deposition 574
Energy pyramid 214
Energy shadow, longshore deposition 574
Energy systems
  principles of 47
  streamflow 533
Enrichment, soil 304
Entisols 318, 320
Entropy, geographic cycle 551
Eons, geologic 29
Ephemeralism 235
Epicenter, earthquake 480, 482
Epipelagic zone 205, 206
Epiphytes 249
Epochs, geologic 29
Equator 21
  great circle 22
  insolation 63, 64
Equatorial air masses 128
Equatorial counter-current 102, 107
Equatorial current 101
Equatorial gyres 102
Equatorial low-pressure belt 88, 89
Equatorial Plume Group 424

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-0-521-76428-5 - Physical Geography: Great Systems and Global Environments
William M. Marsh and Martin M. Kaufman
Index
More information

Equatorial wet climate 153, 161, A2
Equatorial zone 23
global circulation 95
Equilibrium, in Earth systems 5
dynamic 47
Equilibrium surface temperature 46, 51
Equinoxes 44, 45
insolation 63
precession 180
Eras, geologic 29
Ergs 623
Erodibility 534
Erosion
coastal systems 569, 580
deforestation 280
deserts 257
glacial 595
landforms 596
lateral 541
stream 530, 531, 534
threshold 4
wave 569
wind 620
See also Denudation; Soil erosion
landforms 622
Erosional systems 501
Erosion cycle 503
Erratics 600, 601
Eruptions, volcanic 491
Eskers 600
Estuarine deltas 579
Ethiopia, early humans 270
Euler pole 449
Eurasian plate 450, 453
Eurasia, thermal regime 77, 94
Europe
arrival of agriculture 277
early humans 270
Eutrophication 212, 400
Evaporation
latent heat of 71
North Atlantic 604
ocean surface 4, 11, 338
solar energy 34
Evaporites 430
Evapotranspiration 302, 303, 345
drought 348
pedocals 315
Everglades wetland system, land use 402
Evergreen habit 236
Exchange time
atmospheric 59
riverine lakes 396
Exfoliation 513
Exogenous energy 411
Exotic streams 259, 276, 348, 368
Exotic terranes 453, 460
Extinctions 29, 175
K–T 175, 416
Pleistocene 602
Extratropical cyclones 128
Extrusive igneous rock 428
Eye, hurricanes 137
Eye wall, hurricanes 137

F

Fahrenheit scale 49
Failed arm, triple junction 456
coastal development 575
river-system formation 549, 575
Falls, rock 520
Family 233
Fans, alluvial 517
Farming. *See* Agriculture
Faulting 473
mid-ocean ridges 444
Fault line 476
Fault plane 476
Faults 476
types 477
Fault scarp 476
Fault systems
behavior 480
locked segments 480
Feedback 5, 6
ecosystems 218
enhanced hydrologic cycle 355
Feldspar 427
chemical weathering 512
Fell fields 259
Felsenmeer 514
Felsic minerals 427, 429, 433
Felsic rock 417
Ferns 233
Fertile Crescent, early agriculture 272, 274, 277
Fertility, soil 305
Fertilizers 283, 284, 287, 330
groundwater pollution 393
Fetch 564
Field capacity, soil 301, 303, 345, 386
Finger Lakes 598
Fire
clearing agricultural land 278
effect on plants 237, 239
use by early humans 269, 270
Firn 591
Fish 242
anadromous 243
Fjords 579, 580, 597
Flares, solar 38
Flash floods 365
Flax, early agriculture 273
Flood basalt 489
Flood deposits 535, 542
Flooding 372
hurricanes 140
Floodplains 372, 374, 375
features 542
formation 542
Florida
karst system 395, 512
lightning risk 143
Floristic associations 234
climatic factor 234
disturbance 237
geographic barriers 236
Flows 520
Flow separation 616, 623
Flow velocity
glaciers 592
stream channels 533
Flyways, migration 243
Focus, earthquake 480
Fog
advection 116
cold-air drainage 73
Föhn wind 123, 618
Folded mountains 473
Folding 473, 474
Ridge and Valley province 479
Folds 477
overturned 479
types 478
Food chains 213
Food production, post-World War II 287
Food, surplus, early agriculture 275
Footslope 516
Footwall 476
Forbs 258
Forces of change 3
Forces, stabilizing vs. destabilizing 3
Forearc basins 454
Foreset beds 546
Forest biomes 247, 248
Forest clearing. *See* Deforestation
Forests
and early agriculture 278
as mediator 204
boreal 18, 253
cloud 251
deciduous 252
midlatitude rainforests 254
mixed 252, 253
monsoon 251
sclerophyll 255
soil-forming regimes 316, 323, 325
subtropical 252
temperate 18, 251
tropical montane 251
tropical rainforest 18, 249, A2
west-coast 254
wind damage 617
Fossils, climate-change indicators 173
Founder crops, early agriculture 273
Fraction
representative 25, A10
Free dunes 624
Freeze–thaw cycles
soil-forming regime 318
Fronts
cyclonic precipitation 128
Gulf Stream 104
Frost 75
Frost heaving 607
Frost thrusting 607
Frost wedging 514
Fujita tornado scale 142
Fukushima Nuclear Power Plant, windborne contaminants 98
Fungi 202
soil 299, 300
Funnel cloud 126

G

Gabbro 429
Gaia hypothesis 219
Galileo Galilei (1564–1642), heliocentrism 41
Ganges River
sediment output 544
watershed 378
Gaseous cycle 210
Gaspra 415
Gelisol 320
Genus 233
Geocentrism 41
Geochronology 440
Geographic cycle 550
Geographic Information Systems (GIS) 16, 26
Geographic positioning 15
Geography, physical
perspective 8
scale 8
Geoid 21
Geologic time 29
Geology, processes 8
Geomechanical soil-forming regime 318
Geomorphic soil-forming regime 318
Geomorphic systems 499
and plate tectonics 502, 504
open and closed 524
soil 296
Geostrophic winds 92
Geothermal ecosystems 207
Geothermal energy 34, 51
Germination 238, 239

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-0-521-76428-5 - Physical Geography: Great Systems and Global Environments
William M. Marsh and Martin M. Kaufman
Index
More information

Gettysburg Valley 469, 471
Gilgae 324
Glacial drift 297, 389, 599
  lakes 396, 397
Glacials 176, 601
Glacial systems 587
Glaciation 176, 206
  effect on biota 261
  effect on hydrologic system 351
  erosion 595
  landforms 596
  North American 602
  Pleistocene 600
  surface deposits 297
  temperate forests 252
  Wisconsinan 603
Glacier National Park, global warming 592, 593
Glaciers 340, 588
  alpine 589, 592, 596
  basal sliding 592
  calving 594
  constrained 590, 597
  continental 589, 598
  debris
    deposition 598
    landforms 599
    transport 596
  deposition 598
  effect of global warming 340
  erosion 595
    landforms 596
  ice bands 588, 591
  input and growth 591
  lee-slope 590
  mass budget 593
  melting 33
  movement 591
  plastic deformation 590, 592
  polar 590
  scouring of mountains 471
  snout 592, 594, 599
  subpolar 590
  surging 592, 594
  temperate 590
  terminus dynamics 594
  types 589
  unconstrained 590
  valley 589, 591, 592
Glacier systems 506, 507
Glaciofluvial deposits 599
  landforms 600
Glen Canyon Dam 353
Gleysols 325, 326
Global circulation system 20, 83
Global climate system 148
  midlatitude engine 155
  tropical engine 152
Global climate types A2
Global coordinate system 21
Global nutrient systems 209
Global warming 46
  and agriculture 195
  and atmospheric circulation 193
  and ecosystems 196
  and hydrologic cycle 354
  and hydrologic system 194, 339, 351, 354
  and ice caps and glaciers 340, 592, 593
  and land use 195
  and periglacial environment 607
  and sea level 194
  and soil erosion 331
  and temperature 71, 192
  K–T explosion 416
  uncertainty 151
    See also Climate change
Global water system 335
Glossopteris, distribution 237
Gneiss 433
Goats, domestication 274
Good Friday Earthquake 484
Gorges 548
Graben 478
Graded profiles 551
Gradient
  downstream 532
  thermal 68
Gradualism 550
Grains, early agriculture 272, 273
Grand Canyon 461
  strata 475, 502
  streamflow velocity 533
Granite 429
  chemical weathering 512
  mechanical weathering 513
Granitic rock 417, 427
Grassland
  agriculture 257
  savanna 255
  soil-forming regimes 317, 326
  soil organic content 299
Grassland biomes 256
Graupel 121
Gravel bars 538
Gravel beds 535
Gravity 3
  in subduction 447
  stream systems 531
Gravity water 300, 302, 306, 345, 386
Grazing
  effect on landscape 241
  effect on soil 330, 518
  savanna 255
Great African Plume 425
Great American Interchange 246, 463
Great Basin 478
Great Bear Lake 397, 399
Great circles 22
  routes 22
Great East Japan Earthquake (2011) 484
Great Lakes 396, 397, 399
  glaciation 603
  thermal regime 77
Great Plains 257
  1930s dust storms 616, 622
  loess 621
  wind systems 619
Great Rift Valley. *See* East African Rift System
Great Rivers 341, 359
Great Salt Lake 351, 400, 430
Great Slave Lake 397, 399
Great Systems 2, 34
  interconnection 9, 532, 562
Greenhouse effect 40, 182
  See also Global warming
Greenland
  albedo 66
  effect of global warming 194
Greenland ice cap 17, 589, 590
  hydrologic cycle 340
  icebergs 595
  oxygen isotopes 173
Green roofs 165
Greenwich Mean Time (GMT) 16
Greenwich Meridian 23
Grid north 27, A10
Groins 581
Gross sediment transport 572
Ground heat 70, 71, 74
Ground moraines 599
Groundwater 302, 306, 346
  and streamflow 343, 344, 360, 361, 364, 366, 394
  contamination 392
  human impact 391
  perched 401
  saline 392
  stream systems 531
Groundwater basins 390
Groundwater flow 387
Groundwater systems 343, 385
  water-budget model 344
Groundwater wetlands 401
Gulf of Aden, triple junction 456
Gulf of Mexico, hurricane forecasting 139
Gulf Stream 103, 154, 339, 561, 604
Gullying 331, 517
Gust front 126
Guyots 458
Gymnosperms 233
Gypsum 430
Gyres 101

H

Habitat 207
Habitat amplitude 238
Habits, plants 235
Hadley cells 89, 154
Hail 121
Haiti, 2010 earthquake 484, 485
Halite 426, 430
Halley, Edmund (1652–1742), Mediterranean Sea evaporation 341
Hanging valleys 597, 598
Hanging wall 476
Hardpan 306, 316
Hard-surface materials, effect on climate 186
Harmattan wind 618
Harrison, John (1693–1776), chronometer 16
Hawaii 457
  emergence/submergence 578
  orographic rain 122
  shield volcanoes 489
Heat capacity 48, 94
  volumetric 70
Heat circulation system, landscape 70
Heat energy 46, 48
  Earth's internal system 34, 423
  measurement 48
Heat flow 70
Heat islands 187
Heat reservoirs 51
Heat syndrome 187
Heat transfer 50, 68
  Earth environments 68
  mantle 424
  ocean currents 103
Heliocentrism 41
Heliopause 42
Heliosphere 42
Herbivores 214
Herders, effect on environment 278
Hibernation 242
Hierarchy, nested 5, 368
High-latitude zone 23
  global circulation 99
High Plains Basin 390
High pressure 86, 91
  See also Subtropical high pressure belt

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-0-521-76428-5 - Physical Geography: Great Systems and Global Environments
William M. Marsh and Martin M. Kaufman
Index
More information

Hillslopes
deposits 535
form and formation 523
mass balance 523
processes 516
retreat 523, 524
Himalayan Mountains
formation 184, 351, 453
influence on Earth systems 7
influence on hydrologic system 351, 464
Hindu Kush 33
Historical records, climate change indicator 174, 177
Histosols 320, 322, 325
Hoar 75
Holocene Epoch 272, 601
Homeostasis 218
Homeotherms 242
Hominins 268
Homo erectus 268
Homo neanderthalensis 268, 270
Homo sapiens 176, 268
See also Humans
climate change 269
geographic diffusion 269
Hoover Dam 353, 553
Horns 597, 598
Horse latitudes 96, 338
Horses
domestication 275
introduction to Great Plains 279
Horst 478
Horton, Robert (1875-1945), role of landscape in runoff 362
Hotspots 457
Yellowstone 461
Huang-he Valley, cultural hearths 276
Hubble, Edwin (1889-1953) 41
Hudson Bay, isostatic rebound 419, 578
Humans 267
agriculture and productivity 224
and climate 163, 243
compartmentalized world view 288
cultural hearths 275
deforestation 250
disturbance of floristic associations 237
early agriculture 177, 272
early diet 270
geographic diffusion 269, 277
geographic roots 1
impact on biosphere 206
impact on coastal systems 580
impact on ecological balance 219
impact on groundwater 391
impact on hydrologic system 352
impact on lakes 400
impact on landscape 12, 241
impact on stream systems 553
impact on water resources 406
origin 268
phosphate pollution 212
Pleistocene 602
prehistoric 176, 268
processes 8
understanding of Earth 12
urban living 2
water use 403
See also Industrial Revolution
Humboldt Current 104
Humboldt River 342, 343
Humid continental cold climate 162, A7
Humid hydrologic regime 346
Humidity 115
Humid midlatitude soil-forming regime 316
Humid soil-water regime 303
Humid subtropical climate A7
Humus 299
Hunter-gatherers 269, 270, 272, 274
Hurricane Ike 140
Hurricane Katrina 140, 193, 375, 547
Hurricanes 20, 99, 135, 149
as hazard 139
effect of global warming 193
forecasting 139
impact of global warming 563
origin, scientific method 10
tree blowdown 617
Hydration 512
Hydraulic conductivity 386
Hydraulic gradient 387, 388
Hydraulic pressure, waves 569
Hydrogen
cation exchange 305
pH 305
Hydrograph, streamflow 365
Hydrologic cycle 337
and global warming 354
continents 339
enhanced 354
geographic and seasonal variation 338
ice caps 340
See also Water cycle
Hydrologic regimes 346
Hydrologic system 335
and global warming 194, 339, 354
atmospheric phase 337
continents 338
distribution 336
groundwater 343
human modification 352
natural modification 349
oceans 17, 336, 338
origin 336
processes 8
rivers 341
soil 300
solar energy 337
water-budget models 343
Hydrolysis 512
Hydrophytes 235
Hydrosphere 2
water cycle 4
Hydrostatic pressure 388
Hydrothermal vents 205, 207
Hypocenter. *See* Earthquakes, focus
Hypothesis, scientific 11

I

Ice Age, Pleistocene 272, 601
causes 604
Ice ages 174, 176
Ice, atmospheric 59
Icebergs 594
Ice caps 17, 339, 589, 590
effect of global warming 340
Ice cores 173
Ice crystals 121
Ice exclusion 105
Ice glaze 132
Iceland, ridge island 444, 446
Ice pedestals 34
Ice sheets, oxygen isotopes 173
Ice shelves 587
Ice wedging. *See* Frost wedging
Ida 415
Igloos 164
Igneous rock 428
chemical weathering 512
Illumination, circle of 45
Illuviation 306, 307
Impact craters 415
Impeded dunes 625
Inceptisols 318, 320
Incident radiation 67
Indian–Australian Plate 450
collision with Eurasian Plate 453
Indian Ocean 17
ITCZ 96
longshore transport 572
India, summer monsoon 464
Induction 10
Inductive surveys 11
Indus River
2010 flood 373
sediment output 544
watershed 378, 379
Industrial Revolution
coal mining 285
drainage and soil erosion 284
impact on natural systems 282
machinery 284
population 283
technology 283
Industry
groundwater pollution 392
water use 404
Indus Valley, cultural hearths 276
Infiltration 362, 365, 386, 630
Infrared radiation 39, 61, 74
Initial wave, cyclone development 133
Input–output systems 5
glaciers 591
soil systems 295, 296
water systems 343
Insects 240, 241
tropical rainforest 250
Inshore zone 570
Insolation 39, 63
Instability, atmospheric 117, 153
Intensity
earthquakes 484
solar, and latitude 63
Interaction, systems 4
Interception, of precipitation 362
Interconnections 9, 532, 562
Interference, atmospheric 60
Interflow 360, 361, 366
Interfluves 548, 551
Interglacials 176, 601
Intergovernmental Panel on Climate Change (IPCC) 190
Interstate Highway System 286
Intertropical convergence zone (ITCZ) 95, 134, 153, 154, A2, A3
Intertropical zone. *See* Tropical zone
Intrusive igneous rock 428
Inversion layer 127
Inversion, temperature 119, 132
Invertebrates 242
Ions
dissolved load 531, 536
soil 304
leaching 306
Iridium, K–T explosion 416
Irish Potato Famine 279
Iron, oxidation 512
Irrigation
circles 392
early agriculture 277
Middle East 352
Nile Valley 280
salinization 277, 314, 327
Island arcs 444, 449, 451, 457, 458
Islands. *See* Barrier islands
types and formation 457
Isobaric pressure 85
Isobars 86, 90, 130

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-0-521-76428-5 - Physical Geography: Great Systems and Global Environments
William M. Marsh and Martin M. Kaufman
Index
More information

Isolines 28
Isopleth maps 28
Isostasy 419, 504, 578
Isotherms 76, 78

J

Jack pine, and fire 237
Japan
  earthquake hazard 487
  Sendai earthquake (2011) 484
Jet stream 92, 106, 156, 157, 615
Joint lines 513
Joule 48, A1
Juan de Fuca Plate 450, 454, 455, 460
Jupiter 42

K

Kames 600
Kaolinite 324, 512
karst 395
Karst systems 394, 511
  lakes 395, 396
Kasai River 549
Katabatic wind 124
Katmai 1912 eruption 529
Kelvin scale 49
Kepler, Johannes (1571–1630), planetary motion 41
Kettles 600
Khamsin wind 618
Kinetic energy 5, 34, 47, 48, 533
  tides 34
Kingdoms 202
Klasies River, South Africa 270
Knowledge explosion 8
Köppen–Geiger system 159, A2
K–T extinction 8.11, 416
Kuroshio Current 339

L

Labrador Current 595
Lacustrine deposits 298
Lag 622
Lake Baikal 398, 399
  Rift System 451, 461
Lake Bonneville 351, 400
Lake Chad 400
Lake Erie 399
Lake Eyre 396, 399
Lake Huron 399
Lake Michigan 399
  advection 116
Lake Nyasa 398, 399
Lake Okeechobee 402
Lakes 395
  climate change 400
  desert 396, 399
  glacial drift 396, 397
  heat transfer 68
  karst 396
  land use 400
  life cycles 399
  mountain 396, 397
  permafrost 396, 398, 400
  permanent 346
  riverine 396, 399
  shield-margin 396, 397, 399
  tectonic 396, 398, 399
  types and systems 396
Lake Superior 397, 399
  ice 587
  shoreline features 559
  waves 564
  wind systems 613
  winter 57, 171
Lake Tanganyika 398, 399
Lake Victoria 398, 399
Land clearing
  early agriculture 269, 270, 278
  Industrial Revolution 284
Land cover, effect on climate 184
Landfill, groundwater pollution 393
Landforms 499
  and solar radiation 67, 73
  depositional 501
  erosional 501
  glacial 596, 599
  modification by man 280
  products of weathering 515
  wind erosion 622
Landmasses 17
  heat capacity 76, 94
  heat transfer 70, 94
Landscape 499
  and runoff 360
  animals 241
  biosphere as mediator 204
  diversity and microclimate 73
  heat-circulation system 70
  human influence 12
  hydrologic regimes 346
  systems perspective 6
Land–sea breezes 94
Land use
  and infiltration capacity 363
  and soil 329
  effect of global warming 195
  effect on climate 184
  effect on runoff 518
  Everglades 402
  modern systems 285
  periglacial environments 607
  sediment and channel form 537
  transition to farming 273
Language, spread of 270, 277
La Niña phenomenon 107
Lapse rate, adiabatic 117
Large-scale maps 25, A11
Latent heat 11, 70, 71, 74, 95
  convectional storms 124
Lateral moraines 599
Laterite 316, 324, 512
Latitude 15
  and day length 65
  and sun angle 63
  measurement 22
  zones of 23
Lava 428, 489
Leachate 393, 531
Leaching
  and ionic concentration 531, 536
  pedalfers 315
  soil 306
  stream systems 531
Legumes, early agriculture 273
Levees 372, 374, 375, 537, 542
Lewis and Clark Expedition 1804–1806, Columbia River Gorge 16
Lianas 249
Lichen, chelation 512
Life cycle, flowering plants 238
Life, first appearance 174
Lift, bed-load movement 535
Lightning 125, 143
Lignite 431
Lime, addition to soil 305
Limestone 430
  chemical weathering 394, 509, 510, 511, 515
    and climate change 6
  reefs 432
Limits to growth 167
Linear dunes 625
Lithosphere 2, 3, 422, 425
  magma chambers 491
  major features 441
  seafloor spreading 444
  subduction 449
Litter 299
Little Ice Age 177, 594
Little Missouri River, meander movement 540
Littoral drift 571
Littoral transport 571
Littoral zone 205, 206
  productivity 224
Loam 298, 302
Locked segments, earthquakes 480
Loess 297, 314, 616, 621, 628
London, atmospheric pollution 119, 132, 510
Longitude 15, 23
Longshore currents 568, 570
Longshore system 568, 570
Longshore transport 571
  Indian Ocean 572
  rate 571
Longwave radiation 40, 74
Los Angeles, sediment mass balance 573
Lowlands, fluvial 548
Low latitude zones 23
Low pressure 84, 86, 91, 92
  convergent precipitation 134
  cyclonic precipitation 128
  hurricanes 138
  ITCZ 153
Lumber industry, west-coast forests 255
Luminosity, solar 37, 181
Lunar tides 561
Luvisols 326

M

Machinery
  Industrial Revolution 284
  Post-World War II 287
Mackenzie River
  sediment output 544
  watershed 378, 379
Macronutrients 209
Macrophytes 232
  terrestrial 233
Mafic minerals 427, 429, 433
Mafic rock 417
Magma 428, 435
  crystallization 426
  mid-ocean ridges 444
  subduction zones 448
  volcanoes 461
Magma chambers 491
  Yellowstone supervolcano 492
Magnetic banding 440
Magnetic field
  Earth 421
  Sun 38
Magnetic North Pole 27, 421, A10
Magnitude and frequency principle 374, 483
Magnitude, earthquake 482
Malaria 241
Mammals 242
  domestication 274
  first appearance 175
  placental 242, 462
Manicouagan impact crater 415
Mantle 3, 413, 417
  convection 424, 434, 447
  heat transfer 424
  seismic velocity 420
  structure 421
  temperature and pressure 423
  upper 422

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-0-521-76428-5 - Physical Geography: Great Systems and Global Environments
William M. Marsh and Martin M. Kaufman
Index
More information

Mantle plumes 9, 424, 457
Atlantic Basin 444
supervolcanoes 492
Yellowstone 461
Mapping 8, 24
computer 16, 26
digital 16
geological 474
satellite 16, 26
Maps 16, 25
Africa 8
chloropleth 27
isobaric 86, 90, 130
isopleth 28
resolution 26
scale 25, A10
thematic 27
topographic contour 28, A10
types 27
Maquis 255
Marble 433
Marginal basins 451
Marginal sea coast 576
Mariana Trench 441, 444
Marine subarctic climate 162, A8
Marine west-coast climate A6
Maritime climate 157
Maritime thermal regime 76, 94
Mars 17, 42
channel networks 369, 414
early environment 414
impact craters 413
mountain height 505
volcanism 414
Marsupials 242
evolution 462
Mass balance
crustal rock 434
delta systems 546
sediment transport 573
slopes 523
Mass budget, glaciers 593
Mass-budget models 343
Mass extinctions 29, 416
Mass-movement processes 519
Matter, Earth systems 5
Matterhorn 471, 598
Mature stage, geographic cycle 551
Mature wave, cyclone development 133, 134
Mauna Loa 458, 458
Maunder minimum 38
Mayan civilization
deforestation and soil erosion 328
limestone weathering 509
McCourt, Frank, *Angela's Ashes* (1999) 147
Meander loops, jet stream 92, 156
Meanders
flow velocity 533
formation 539
movement 539
Meander scars 542
Measurement, units and conversion A1
Mechanical weathering 511, 513
Medial moraines 599
Mediterranean Basin
early agriculture 280
Roman agriculture 327
sclerophyll forest 255
Mediterranean climate 157, A6
Mediterranean Sea, evaporation 341
Megacaldera 492
Megacities 185
Megadunes 624
Megastorms 126
Mekong Basin, flooding 250
Mekong River
sediment output 544
watershed 368, 378
Meltwater 33, 600
Mercalli scale 484
Mercator. *See* Universal Transverse Mercator (UTM) grid
Mercury 17, 42
atmosphere 414
impact craters 413
temperature range 52
Meridians 23
Mesoamerica
crop domestication 277
cultural hearths 276, 277
Mesocyclones 127
Mesopotamia
cultural hearths 275, 276
early agriculture 272, 274
salinization 277, 314, 327
Mesoscale convective complex 126
Metamorphic rock 433
Metaphysical though 9
Metastability, single-thread channels 538
Methane
greenhouse gas 183
ocean floor 175
Mexico City 189
population 2
Mica 427
Microbursts 126
Microclimates 73
cities 187
Microfauna 241
Microorganisms 202
Microphytes 232
Microplates, accretion 460
Mid-Atlantic Ridge 444, 446
transform faults 454
Middens, organic matter 313
Middle East
early agriculture 272, 274
hydrologic system modification 352
land and drainage system modification 280
water supply 405
Middle latitude zone 19, 20, 23, 24
Midlatitude zone 24
climate 155, 161, A6
desert and steppe A5
convectional storms 125
cyclones 99, 128
global circulation 98
grassland 256
rainforests 254
soil-forming regimes 316, 320
thermal regime 94
Mid-ocean ridges 440, 442, 444
Midslope 516
Migration 243
early humans 268, 269, 277
salmon 243
impact of dams 553
restoration projects 554
sand dunes 624
Milankovitch cycles 179
Millibar 85, A1
Minerals
carbonate 426
rock-forming 426, 429
silicate 426
soil 304
Mining 285
Misfit streams 597
Mississippi Delta 546, 579
and land-use development 547
nitrogen pollution 331
Mississippi River system
alluvium 389
average discharge 341
flooding 363
levees 372, 375
meanders 539
sediment output 543, 544
triple junction 456
vegetation 259
watershed 368, 378, 379, 549
Mixed forests 252, 253
Mixing layer 105
Mohorovicic (Moho) discontinuity 420
Moisture
condensation processes 116
soil 302
See also Water-vapor precipitation system
Molecules, organisms 209
Mollic soil horizon 323
Mollisols 320, 322, 323
Moment magnitude scale 483
Monera 202
Monocline 478
Monocotyledons 233
Monsoon climate A4
Monsoons 94, 97, 154, 161, 351, 618, 464
See also Summer monsoon; Winter monsoon
Montane forests, tropical 251
Monterey Bay, plate tectonics 460
Montreal, Canada, temperature 66
Moon
formation and composition 413
influence on tides 561
Moraines 599
Wisconsinan substage 603
Morphogenetic regions 552
Mountain building. *See* Orogeny
Mountain lakes 396, 397
Mountain permafrost 606
Mountains
denudation rates 518
height limit 504
influence on climate 184, 464
influence on Earth systems 6, 494
influence on hydrologic system 6, 351
influence on wind 619
midlatitude climate 162
orographic precipitation 122
soil-forming regimes 320, 325, 326
structure 473
types 473
Mountain systems 469
bioclimatic change 260
vegetation 259
Mount Everest 505
Mount Pelee, 1902 eruption 494
Mount Pinatubo, 1991 eruption, global ash cloud 9, 98, 181, 495, 615
Mount St. Helens
1980 eruption 492
re-establishment of biota 263
Mount Tambora, 1815 eruption, global impact 495
Mount Vesuvius, AD 79 eruption 491, 493
Mount Waialeale, Hawaii, orographic rain 122
Mudflows 521

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-0-521-76428-5 - Physical Geography: Great Systems and Global Environments
William M. Marsh and Martin M. Kaufman
Index
More information

Mulka, Australia, drought 349
Murray–Darling River, watershed 378, 379
Muscovite mica 427

N

Nature, human need for 2
Navigation 15
Nazca Plate 450, 452
Neanderthals. *See* Homo neanderthalensis
Neap tides 561
Nearshore circulation cells 569
Nebular disc 412
Needleleaf trees. *See* Conifers
Negative feedback 5, 219
Nelson River, watershed 378, 379
Nematodes, soil 299, 300
Neptune 42
Net radiation 74
Net sediment transport 572
Nevada, groundwater basins 390
Névé 591
New Madrid, Missouri, 1811–1812 earthquake 486
Newton, Isaac (1642–1727), gravity 41
New York City 19
  microclimate 188
Niger River 549
  triple junction 456
  watershed 378, 379
Nile River
  arcuate delta 579
  watershed 368, 378, 379
Nile Valley
  cultural hearths 276
  deflation basins 623
  early humans 270
  irrigation 280
Nimbostratus clouds 132, 133
Nitrogen
  and productivity 223
  atmosphere 59
  pollution 212, 331, 393, 400
Nitrogen cycle 3, 211
Nitrogen fixation 212, 300
  bacteria 218
Non-parallel slope retreat 523, 524
Normal fault 477
North America
  early humans 271
  hydrologic system modification 353
  tornadoes 141
  tropical climate engine 154
  west-coast forests 254
North American glaciation 602
North American Plate 450, 451, 453, 454, 461
Northeast tradewinds 95, 97
Northern hemisphere, thermal regime 77
Northern lights 37
North Pole 22, 27, A10
  magnetic 27, 421, A10
  sun angle 44
North Star, navigation 15
Nutrient cycles 209
Nutrient sink 210
Nutrient systems, global 209

O

Oak
  effect of climate change 240
  sclerophyll forest 255
Obliquity 180, 604
Ob River, watershed 378, 379
Occluded front 133, 134
Occluded wave, cyclone development 133, 134
Ocean basins
  development 454
  gyres 101
  major features 443
Ocean crust 417
  rock recycling 434, 435
Ocean currents 3, 100
  and Ice Age 604
  Coriolis effect 100, 101
  heat transfer 68, 69, 103
  remote sensing 104
  wind generation 100
Oceanic–continent convergence 452
Oceanic–oceanic convergence 451
Oceanic plateaus 453
Oceans 17, 83
  as geographic barrier 245
  biosphere 205
  color 17
  density 105
  general circulation 100, 103
  heat capacity 76, 94, 100
  heat reservoir 51
  heat transfer 69, 70, 94, 100
  hydrologic system 17, 336, 338
  influence on atmosphere 106
  layers 105
  margins 17
  plate tectonics 183
  Pleistocene 602
  productivity 223
  surface temperature 49, 51
  thermocline 105
  thermohaline circulation 105
  water composition 432
  water volume 17, 336
    See also Air and ocean circulation system
Ocean warming 563
Offshore zone 570
Ogallala Aquifer 390, 391
Old age, geographic cycle 551
Olivine 427
Olympus Mons 505
Omnivores 214
Onshore–offshore transport 573
Open forest 249
Open-pit mining 285
Open systems 4, 524
Order 233
  soil classification 320, 325
Organic mass balance, soil 299
Organic soil 325, 326
Organisms 202
  classification 233
  ecosystems 207
Organization, hierarchical 5
Orinoco River
  average discharge 341
  watershed 377, 378
Orogenic belts 434, 435, 442, 459
  impact on climate 464
  provinces 470
Orogens. *See* Orogenic belts
Orogeny 502, 459
Orographic precipitation 122, 589
Orthoclase feldspar 427
Oscillatory waves 565
Outcrops, mapping 475
Outflow shield, hurricanes 137
Outgassing 210, 336
Outwash plains 600
Overgrazing 241, 627
Overland flow 360, 361, 362, 365
Overturned fold 479
Oxbows 396, 540, 542
Oxic soil horizon 324
Oxidation 512
Oxisols 320, 322, 324
Oxygen, atmosphere 59
Oxygen cycle 3, 211
Oxygen isotopes, temperature proxy 173
Ozone, atmospheric 59, 60
  and CFCs 60

P

Pacific Basin, andisols 321
Pacific Coast, middens 313
Pacific Ocean 17
Pacific Plate 450, 451, 453, 458, 460
Pacific Rim, earthquake hazard 487
Padi farming 280
Pakistan
  water supply 406
    See also Indus River
Pampa 257
Panama land bridge formation 183, 246, 463
  and ocean circulation 604
Pangaea
  animal distribution 245
  breakup 439, 459, 461
    animal distribution 461
    uplift 549
  coastal development 575
  flood basalt 489
  plant associations 237
Parabolic dunes 626
Parallels 22
Parallel slope retreat 523, 524
Parana River 378, 549
Parcel method 117
Parent material
  residual 297
  transported 297
Paris Basin 477
Parkas, down 165
Particle cohesion 3
Particles, ionized 37
Passive coastlines 575, 576, 578
Patterned ground 607
Pedalfers 315
Pediments 525
Pedocals 315
Pelagic zone 205
Peneplain 551
Perched dunes 627
Peridotite 429
Periglacial environments 606
  land use 607
Perihelion 42, 43, 180
Periods
  geologic 29
  wave 565
Permafrost 258, 606
  lakes 396, 398, 400
  soil-forming regime 318
  solifluction 607
Permeability 386, 388
Perovskite 421
Perrault, Pierre (1611–1680), hydrologic cycle 341
Pesticides 284, 330, 393
Petrocalcic soil horizon 317, 322
Phase changes 48, 71
Phloem 232
Phoenicians, navigation 15
Phosphorus cycle 212

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-0-521-76428-5 - Physical Geography: Great Systems and Global Environments
William M. Marsh and Martin M. Kaufman
Index
More information

Photic zone 205
Photosphere 36
  sunspots 37
Photosynthesis 18, 210, 216
  perspective 8
  scale 8
Phreaticism 235, 257
pH scale
  soil 305
Physical thought 9
Phytoplankton 232
Piedmont province 470
Pigs, domestication 274
Pillow lava 428
Pioneer organisms 262
Pisgah Tract, tree blowdown 617
Plagioclase feldspar 427
Plague (Black Death) 177
Plane of ecliptic 42, 44
Planetesimals 413
Planets, non-terrestrial 412
Planets, terrestrial 17, 41, 412
  formation 412
  geography 413
  internal heat 413
Plants 202
  alien species 237, 241, 253
  and climate 234
  and geographic change 238
  domestication 273
  effect of climate change 239
  floristic associations 234
  geographic range 239
  habits 235
  life cycle 238
  loristic associations
    flowering. *See* Angiosperms
  major groups 232
  tolerance 238
  wilting point 301
Plastic deformation 474
Plate tectonics 183, 424, 439
  and coastal development 575
  and distribution of animals 245
  and distribution of plants 237
  and geographic change 462
  and river-system formation 549
  and rock cycle 502, 504
  earthquake hazard zones 487
  effect on hydrologic system 351
  microplates 460
  movement rates 450
  plate borders 451
  plate motion 449
  plate types and distribution 450
  processes 444
  triple junction 456
Platforms, carbonate 580
Playas 348, 377, 396
Pleistocene Epoch 272
  biogeographic change 601
  glaciation 600
    causes 604
  oceanic change 602
Plinthic soil horizon 324
Plutons 428
Podzols 325
Poikilotherms 242
Point bar 540, 541
Polar air masses 128
Polar circle 21
Polar climates 163, A8
Polar easterlies 99
Polar front 89
  cyclones 128, 133
  jet stream 92, 106, 156, 157, 615
Polar glaciers 590
Polar high-pressure belt 88, 89
Polaris, in navigation 15
Polar outbreaks 93
Polar zone 24
Pole of rotation 449
Poles
  day length 65
  insolation 63
Poljes 512
Pollen, climate-change indicator 174, 240
Pollination 238, 239
Pollution
  air 58, 181
  automobiles 287
  groundwater 392
  phosphates 212
  temperature inversion 119, 132
  urban-industrial economies 19, 185
  windborne 98
Pompeii, Vesuvius AD 79 eruption 493
Pontanal 256
Pools 540
Popigai impact crater 415
Population
  and global productivity 226
  food supply 215
  impact on coastal systems 581
  Industrial Revolution 283
  storm risk 137, 140, 141
  water supply 405
Porosity 386
Positive feedback 5, 218, 355
Post-glacial-uplift coasts 577, 578
Potassium 423
Potassium feldspar 427
Potatoes, introduction to Europe 279
Potential energy 47, 533
Potholes 535
  Lake Superior 560
Powder River Basin, coal reserves 300
Power generation, water use 404
Prairie 256
  short-grass 257
  tall-grass 256
Precession 180
Precipitation
  and biome biomass 247
  and elevation 504, 506
  and productivity 220, 222
  and streamflow 341, 364
  condensation nuclei 120
  convectional 122, 124, 156
  convergent 122, 134
  cyclonic/frontal 122, 128, 156
  forms 121
  hierarchy 5
  influence of mountains 6
  landscape controls on 362
  orographic 122, 589
  over land 338
  types 121
  variability 349
    See also Water-vapor precipitation system
Pressure belts 86, 150
Pressure cells 84, 86, 91, 92
  cyclones 86, 132
Pressure gradients 84, 86, 90
Prevailing westerlies 98, 101
Primary consumers 214
Primary production 214, 217, 299
Prime Meridian 23
Principle of stream orders 369
Productivity 208, 220
  and carbon dioxide 222
  and nutrients 223
  and precipitation 220, 222
  and soil organic mass balance 299
  and temperature 220, 221
  biomes 247
  boreal forests 253
  deserts 257, 258
  limiting factors 220
  marine 223
  sclerophyll forest 255
  temperate forests 251
  terrestrial 220
  tropical forests 249, 251
  tundra 258
Prominences, solar 38
Protista 202
Protoplanets 413
Provinces 470
Proxies, climate change 172
Pteridophytes 233
Ptolemy (c.90–c.168AD), geocentrism 41
Pumice 428
Puszta 257
P-waves 419, 481
  velocity 420, 425
Pycnocline layer 105
Pyroclastics 428, 489, 490
  clouds 492
  impact on environment 495
Pyrophytes 235, 237
Pyroxene 427

Q

Qanats 352, 368, 385
Quadrangle maps 28, A10
Quarrying, glacial 595
Quartz 426, 427
Quartzite 433

R

Rabbits, introduction to Australia 279, 463
Radiation 38, 57
  beam 62
  diffuse 62
  electromagnetic 39, 69
  from Earth 40, 46, 74
  heat transfer 68, 69, 71
  incident 67
  infrared 39, 61
  longwave 40, 74
  net 74
  photosynthesis 217
  solar 34, 37, 40, 46, 58, 74, 75, 149
    and landforms 67
    effect of atmosphere 60
    hydrologic cycle 337
    insolation 63
    net 67
    output 181
    stream systems 531
  sun angle 44
  thermal infrared 40
  ultraviolet 39, 60
  visible 39, 61
Radiation zone, Sun 36
Radioactivity, Earth's internal energy 423
Rain 121
  water cycle 4
Rainfall
  hurricanes 136, 137
  light 365

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-0-521-76428-5 - Physical Geography: Great Systems and Global Environments
William M. Marsh and Martin M. Kaufman
Index
More information

long hard 366
long moderate 366
reduction 7
short hard 365
Rainforest, midlatitude 254
wind damage 617
Rainforest, tropical 18, 249
climate 153, 161, A2
deforestation 250
ecosystem 208
heat flux 73
life zones 249
open forest 249
wind damage 617
Rain shadow 123, 506
Rainsplash 331, 516
Rainwash 331, 516
Rainwater, effect of pavement 286
Ramps, shoreline 566
rate of 389
Reasoning
deduction 10
induction 10
Rebound, isostatic 419
Recessional moraines 599
Recession, shoreline 569
Recharge 344, 366, 388
Recycling
rock 433, 502
within ecosystems 209
Red River Flood, North Dakota 373
Red Sea
plate tectonics 451
rift-margin coast 578
triple junction 456
Redwood 255
and fire 237
Reefs. *See* Coral reefs
Reference systems
space 24
time 28
Reflectance, Earth's surface 62
Reflection, solar radiation 60, 62
Reforestation, temperate forests 253
Refraction
solar radiation 64
waves 567
Regosols 325, 326
Regs 623
Rejuvenation 551
Relative humidity 116
Relict dunes 625, 627
Remote sensing 8, 26, 104
Representative fraction 25, A10
Reptiles 242
Reservoirs 353, 396, 406
and channel form 537
effect on plant and animals 553
impact on stream systems 553
Residuals 263
Resistance, stream channels 534
Resolution 26
Respiration 210, 214
Retreat, hillslopes 523, 524
Reverse fault 478
Revolution, Earth 43
Rhyolite 429
Rias 579
Rice, padi farming 280
Richter scale 482
Ridge and Valley province 470
folding 479
Ridge islands 444, 457, 458
Riffles 540
Rift-margin coasts 577, 578
Rift valleys 478
earthquake hazard 487
lakes 398
plate tectonics 456
river formation 549
Rills 517
Rime 121
Rings, Gulf Stream 104
Rio de la Plata, estuarine delta 579
Riparian wetlands 401, 402
Rip currents 566, 569
Ripples, sand 624
Riverine lakes 396, 399
Rivers, mythology 359
River systems 341
vegetation 259
Roads, and environment 286
Roaring Forties 98
Rock 425
crustal mass balance 434
deformation 460
geographic distribution 434
igneous 428
melting point and pressure 423
metamorphic 433
recycling system 433
sedimentary 430
weathering 508
Rock cycle 3
and plate tectonics 502, 504
Rock flour 595
Rock salt. *See* Halite
Rocky Mountains
climate 162
creation 6
thrust faults 478
Rofabards 280
Roman Empire, deforestation and soil depletion 327
Roots, stabilizing force 3
Root wedging 514
Rope lava 428
Rossby waves 92, 128, 156
Ross Ice Shelf, icebergs 594
Rotation
Earth 21, 43, 90
pole of 449
Rotational velocity 21
Roughness layer 614, 616
Royal Observatory, Greenwich, England 16, 23
Runoff 300, 322, 330, 331, 339
and uplift 505
See also Stream runoff system
coefficient of 363, 366
flooding 372
role of landscape 360, 382
role of vegetation 362, 518
stream systems 531
Russia, groundwater pollution 392

S

Sahara Desert 257
barrier to migration 245
bedrock grooves 623
climate 161, 193
dust transport 304, 615, 629
Amazon Basin 530
early humans 270
Sahel, drought 349
Salinization
Assyrian civilization 352
Sumerian civilization 277, 314, 327
Salmon, migration 243
impact of dams 553
restoration projects 554
Salt
arid soil-formation regime 317, 322
groundwater 392
over-irrigation 314, 322
See also Evaporites; Halite
Saltation 621, 623
San Andreas Fault 480, 454
earthquake hazard 487
Sand bars 535
Sandblasting 623
Sand bypassing 581
Sand deposits 314
Sand dunes 622
barchans 625
barrier 626
coastal 619, 626
complex 626
desert 625
formation 623
Great Plains 619
impeded 625
linear 625
migration 624
parabolic 626
perched 627
relict 625, 627
size 624
soil-forming regimes 318, 320
stabilized 625, 627
transverse 625
Sandhills, Nebraska 619, 627
Sand seas 623
Sand sheets 627
Sandstone 430
aquifers 389, 390
weathering 515
Sand streaks 627
Sand, wind transport 621
Santa Ana wind 98, 124, 618
Santorini 491
Sao Francisco River 549
Sapping 517
Satellites 8
mapping 16, 26
ocean currents 104
ocean temperatures 106
Saturation
water vapor in air 115, 116
Saturn 42
Savanna
biomes 255
climate 153, 161, A3
scrub 256
tall-grass 255
thornbush 256
tropical 255
Scale
geographic 4, 5, 8
map systems 25, A10
time measurement 28
Scattering, solar radiation 60, 61, 62
Scavengers 214
Science 9
Scientific hypothesis 11
Scientific knowledge, explosion 8
Scientific method 10
Scientific thought 9
Sclerophyll forests 255
Scour channels 543
Scouring 534, 536
glacial 595, 596
Scrolls, meander scars 542
Scrub savanna 256
Sea
temperature 563
wave motion 563
Sea breezes 94
Sea caves 570
Sea cliffs 570, 576
wave-energy 567

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-0-521-76428-5 - Physical Geography: Great Systems and Global Environments
William M. Marsh and Martin M. Kaufman
Index
More information

Seafloor spreading 444
Sea ice 105
Sea level
effect of global warming 194, 563
emergent coasts 577
impact on coastal population 581
Pleistocene 602
submergent coasts 578
Seamounts 443, 457
Sea of Japan
back-island basin 451
Sea of Okhotsk, back-island basin 451
Seasons 20, 43
Sea stacks 570
Sea voyages, early humans 277
Seawalls 580
Seawater, composition 432, 513
Secondary circulation 99
Secondary consumers 214
Sediment
and land elevation 505
denudation 503
deposition, deltas 545
effect on channel ecology 331
Lake Superior 560
sorting 621
stream systems 530, 535
watershed systems 543
Sedimentary cycle 209
Sedimentary rock 430
chemical 430
detrital 430
Sedimentation, continental shelf 431
Sediment load 535, 536, 542
Sediment sink 570
Sediment source 570
Sediment transport
and discharge 536
coastal systems 570
deltas 545
glaciers 596
Great Rivers 544
gross 572
in-stream 535
longshore 571, 572
mass balance 573
net 572
onshore–offshore 573
stream systems 543
Seeds, angiosperms 238, 239
Seine River 477
Seismic waves 419, 480, 481
velocity 420
Seismograph 420, 481
Seismology 419
Selective breeding 277, 279
Semiarid hydrologic regime 347
Semiarid runoff and erosion rate 518
Semiarid soil-forming regime 317
Semiarid soil-water regime 303
Semipermanent pressure cells 87
Sendai, Great East Japan Earthquake (2011) 484
Sensible heat 70, 71, 72, 74
Settlements, stable 275
Sewage 404, 406
Shale 430
Shamal wind 618
Shanghai, population 2
Shear strength 519, 522
Shear stress 473, 519
Shear waves. *See* S-waves
Sheep, domestication 274
Sheetwash 331
Shelter, from climate 164
Shield-margin lakes 387, 396, 399
Shields 434, 435, 442
Shield volcanoes 489, 490
Shipping, introduction of alien species 279
Shore 570
Shoreline
deep-water 567
erosion 580
features, Lake Superior 559
recession 569
shallow-water 566
See also Littoral zone
Short-grass prairie 257
Shredders 299
Sidereal day 43
Sierra Nevada, normal faults 477
Silicate minerals 426
Sills 428
Silt 297, 298, 302
wind transport 621
Silver Springs River, discharge 364
Similarity factor, animal families 246
Simoon wind 618
Single-thread channels 538
Sinkholes 394, 512
Sink, sediment 571
Sinuosity, meanders 539
Sirocco wind 618
Sky, blue color 61
Sleet 121
Slickensides 324
Slides 520
Sliding, basal 592
Slip face, sand dunes 624
Slopes
complex 525
concave 525
convex 525
evolution 524
forms 524
mass balance 523
retreat 523, 524
S-shaped 525
stability 519
straight 525
Slumps 520
Small circles 22
Small-scale maps 25, A11
Smog, London 119, 132
Snout, glacial 593, 594, 599
Snow 59, 121
albedo 66, 67
in glacier formation 591
See also Blizzards
Snowflakes, formation 121
Soil
ancient civilizations 327
as biochemical system 304
as ecosystem 298
as geomorphic system 296
as hydrologic system 300
cation exchange 305
chemical processes 304
fertility 305
field capacity 301, 303, 345, 386
heat transfer 69
leaching 306
middens 313
minerals 304
modern land use 329
organic mass balance 299
organic matter 298, 317, 318
particles 297
pH 305
texture 298
volumetric heat capacity 70, 94
water
input and output 302
types and processes 300
Soil classification 319
Canadian system 325
US system 320
Soil–climate moisture regimes 303
Soil creep 521
Soil erosion
and global warming 331
by deforestation 280, 503
ancient civilizations 327, 328
causes 330
effect on channel ecology 331
modern agriculture 287, 295, 297, 330, 503
processes 331
Soil formation
geographic environment 315
Soil-forming factors 315
Soil-forming regimes, bioclimatic 315
Soil-heat balance, periglacial environment 607
Soil horizons 307, 316, 320
Soil mantle 296
Soil-moisture gradient 302
Soil-moisture system 302
water-budget model 345
Soil profiles 307
Soil systems 293
input and output 295, 296
Soil terracing 268, 280
solar 34
Solar constant 37, 38, 58, 61
Solar day 43
Solar dynamo 35
Solar energy system 34
See also Solar radiation
Solar flares 38
Solar luminosity 37, 181
Solar prominences 38
Solar radiation 20, 33, 34, 37, 40, 46, 58, 74, 75, 149
and landforms 67
effect of atmosphere 60
hydrologic cycle 337
insolation 63
net 67
output 181
photosynthesis 217
stream systems 531
sun angle 44
Solar System 17, 35, 42, 412
planets 41, 412
Solar wind 37, 38
Solifluction 521, 607
Solonetz soil 325, 326
Solstices 44, 45
day length 65
sun angle 64
Solum 296, 309
Solution weathering 570
Sonora Desert 258
climate 162, 193
South America, early humans 271
South American Plate 450, 452
Southeast tradewinds 95, 97
South equatorial counter-current 102
Southern hemisphere, thermal regime 77
Southern lights 37
Southern Oscillation 107
South Pole 22
Soviet Union, groundwater pollution 392
Space, reference systems 24
Species 202, 233
Specific humidity 116
Speech, early humans 270

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-0-521-76428-5 - Physical Geography: Great Systems and Global Environments
William M. Marsh and Martin M. Kaufman
Index
More information

Spheroidal weathering 514
Spillways, and channel degradation 537
Spiral bands, hurricanes 136
Spits 574
Spodic soil horizon 323
Spodosols 320, 323
Spores 233
Spring tides 561
Squall line 131
S-shaped slopes 525
Stabilized dunes 625, 627
Stabilizing forces 3
Standing crop 204
Standing waves 623
Stars, navigation 15
Staten Island cemetery project 293
Steady-state principle 47, 388
Steamboat Springs 374
Stefan–Boltzmann's law 36, 39
Stemflow 362
Steppe 257
  climate A4, A5
St. Helena 444, 446
Stimulus diffusion 277
St. Lawrence River, sediment output 544
Stormdrains 371
Storms
  tropical 135
  violent and destructive 138
Storm systems 20, 132, 150
  convective 124, 151
Stormwater 361, 363, 366, 371
Straight slopes 525
Strain energy 480
Strata, horizontality 475
Stratocones 490
Stratocumulus clouds 132, 133
Stratosphere 60
Stratus clouds 132, 133
Stream
  antecedent 548
  superposed 548
Streamflow 532
  and groundwater 343, 394
  cave systems 395
  hydrograph 365
  response to precipitation 364
  sources of water 360
  turbulence 533
  watersheds 370
Stream orders, principle of 369
Stream-runoff system 341
  and uplift 505
    See also Denudation
Streams
  ecosystems 260, 407
  exotic 276, 348, 368
Stream systems 20, 505, 530, 537
  and gravity 531
  and solar energy 531
  atmospheric input phase 530
  diversion 406
  driving forces 531
  groundwater phase 531
  human impact 553
  leachate 531
  management 554
  patterns 369
  restoration 554
  scouring 534
  sediment 530, 535
  surface runoff phase 531
Stress
  in plants 238
  in rock 473
Strike 475
Strip mining 285
Subaerial zone 203
Subarctic zone 24
  soil-forming regimes 325, 326
Subduction 425, 435, 447, 451
Subduction zones
  earthquake hazard 487
  marginal basins 576
Submarine permafrost 606
Submergent coasts 578
Subpolar glaciers 590
Subpolar gyres 102
Subpolar low-pressure belt 89, 92, 99
Substage, glacial 603
Subsurface zone 203
Subtropical dry climate 161, A4, A5
Subtropical forests 252
Subtropical gyres 101, 102
Subtropical high pressure belt 89, 96, 97, 153, 154, 157
Subtropical jet stream 93
Subtropical moist climate A7
Subtropical zone 24
Suburbia 1, 286
Succulence 235
Sudbury impact crater 415
Sumerian civilization 275
  soil salinization 277, 314, 327
Summer monsoon 94, 97, 99, 351, 373, 464
Summer solstice 44, 45
  day length 65
  sun angle 64
Sun
  active 37
  energy output 37
  energy system 34
  formation 412
  magnetic field 38
  influence on tides 561
  quiet 37, 38
  Solar dynamo 35
  structure 35
Sun angle 44
  and latitude 63
  midlatitude zone 152
Sun–Earth energy system 33
Sunspots 37, 38, 181
Supercells 127
Super Outbreak tornadoes 142
Superposed stream 548
Supersaturation 116, 120
Supervolcanoes 492, 495
Surface creep 621
Surface deposits 297
Surface water
  arid-landscape regime 348
  humid-landscape regime 346
  semiarid-landscape regime 347
Surface waves 481
Surface winds 614
  geographic patterns 618
Surface zone 203
Surficial wetlands 401
Surge dome 138, 140
Surging glaciers 592, 594
Suspended load 535, 571
  movement 536
Suspension 621
  and topography 619
Sustainability 167
Swallowtail butterfly, climate and species numbers 244
Swamps 542, 543
  See also back-swamps
Swash 571
S-waves 419, 481
  velocity 420
Swell 563
Syncline 478
Synoptic systems 87
System balance 5
Systems. *See* Earth systems; Great Systems
Systems perspective 6

T

Taiga 253
Tall-grass prairie 256
Tall-grass savanna 255
Talus 520, 542
Tarns 397, 598
Technology
  adapting to climate 166
  Industrial Revolution 283
  post-World War II 287
Tectonic coasts 577
Tectonic lakes 396, 398, 399
Tectonic plates. *See* Plate tectonics
Temperate climate 162, A6
Temperate forests 18, 251
  deforestation 252, 253
  glaciation 252
Temperate glaciers 590
Temperature 48
  air 35, 49
    cities 72, 184, 185
  and productivity 220, 221
  diurnal and seasonal range 52
  effect of elevation 78
  effect of global warming 192
  equilibrium surface 46, 51
  global patterns 76
  ocean surface 49, 104, 106
Temperature inversion 119, 132
Tensional stress 473
Tephra 428
Terminal moraines 599
Termites 241
Terraces
  floodplain 543
  marine 576
  wave-cut 577
    See also wet-terrace farming
Tertiary consumers 214
Tethys Sea 246, 351, 453
Thalweg 538
  meanders 539
Thematic maps 27
Thermal anomalies 106
Thermal gradient 68
Thermal-infrared radiation 40, 74
Thermal pressure cells. *See* Thermals
Thermal regimes 76
Thermals 85, 86, 126
Thermocline, ocean 105
Thermodynamics, second law 68
Thermohaline circulation system 105, 605
Thermometer 49
Thermoregulation 242
Thoreau, Henry David (1817–1862), Walden (1854) 2
Thorium 423
Thornbush savanna 256
Thought
  metaphysical 9
  physical 9
  scientific 9
Three Gorges Dam, Yangtze River 375, 407, 553
Threshold of stability 3
Threshold velocity, wind transport 621
Throughfall 362
Thrust fault 478

© in this web service Cambridge University Press www.cambridge.org

Thrust sheets 460
Thunderstorms 124, 125
as hazard 143
Tibetan Plateau 453
Tides 561
kinetic energy 34
Tierra del Fuego 98
Till 599
Time
geologic 29
measurement of 28
reference systems 28
Titanic 595
Tolerance, in plants 238
Tombolo 574
Tools, early humans 269
Topographic contour maps 28, A10
Topset beds 546
Topsoil 298, 307, 316
Tornado Alley 141, 143
Tornadoes 88, 113, 126, 131, 151
as hazards 140
Tortuous channels 539
Traction 621
Tradewinds 89, 95, 97, 101, 153, 618, A3
Transform faults 454
Transform plate borders 453
earthquake hazard 487
Transhumance 244
Transient conditions, and infiltration capacity 363
Transient pressure cells 87
Translatory waves 565
Translocation, soil 305, 306
Transmission, aquifer 388
Transparency, atmospheric 181
Transpiration 302
Transportation, development 277
Transverse dunes 625
Treeline 260
Tree rings, climate change indicator 174
Trees 233
and slope stability 522
blowdown 319, 617
broadleaf 236, 252, 255
coniferous 233, 236, 252
deciduous 252
dwarf 254, 258
wind-throw and soil-formation 319
Trenches, subduction 442, 444, 447, 452
Tributary sediment 535
Triple junctions 456
coastal development 575
river-system development 549, 575
Tristan da Cunha 444, 446
Tri-State Outbreak tornado 142
Trophic levels 214, 215
soil 299
Tropical air masses 128
Tropical climates A2
Tropical depressions 135
Tropical desert and steppe climate A4
Tropical easterly jet stream 93
Tropical montane forests 251
Tropical rainforests 249, A2
Tropical savanna 255
climate 153, 161, A3
Tropical storms 135
Tropical wet climate 153, 161, A2
Tropical wet–dry climate 153, 161, A3
Tropical wet soil-forming regime 316
Tropical zone 23
climate engine 152, 158, 161
global circulation 95
soil organic content 300
Tropic of Cancer 23
Tropic of Capricorn 23
Tropopause 60
Troposphere 60, 85, 614
cyclones 132
sediment transport 615
Tsunamis 482, 562
Sendai earthquake (2011) 485
Tuff 530
Tundra 254, 607, 608
biome 258
climate A8
permafrost lakes 396, 398
Turbulent flow 533, 535, 536
Typhoons 99, 135

U

Ultisols 320, 322, 323
Ultraviolet radiation 39, 60
Uncertainty, climate systems 151
Unconstrained glaciers 590
Undercut bank 540
Uniformitarianism 550
United States
Pacific Northwest, cyclones 151
storm hazzard 138, 141
water use 403
Universal Soil Loss Equation 330
Universal System of Biological Names 233
Universal Transverse Mercator (UTM) Grid A10
Upcoming, saline groundwater 392
Updrafts 124, 126, 127
Uplands, fluvial 548
Uplift 503, 505
and stream development 549
post-glacial 578
Upper-air divergence 130
Upper zone 203
Upwellings 101
Uranium 423
Uranus 42
Urban heat island 186
Urbanization 1, 2, 19
and air temperature 72, 184, 185
and albedo 67
and climate 185
groundwater pollution 393
impact on drainage systems 371
pollution 182
waste 19
water use 404
Urban Revolution 285
Uruguay River 549
US Comprehensive Soil Classification System 320
US Geological Survey
topographic quadrangles 28, A10
U-shaped valleys 551, 597

V

Valley glaciers 589, 591, 596
Valleys
cold-air drainage 73
glaciation 589, 596
Valley wall 541
formation 541
geographic cycle 550
Vancouver Island 454, 460
Vascular plants 232, 233
Veering wind shift 133
Vegetation 232, 234
and climate 184
and slope stability 522
biomes 246
geographic change 239
rainwash and rainsplash control 516
river and mountain systems 259
runoff control 362, 518
stabilizing force 4
Velocity
flow 533
rotational 21
streamflow 533
wave 565
Ventifacts 622
Venus 17, 42
atmosphere 414
clouds 18
Vernal equinox 44, 45
Vertebrates 242
Vertisols 318, 320, 324
Visible radiation 39, 61
Volcanic ash 428, 529
soil-forming regime 318, 321, 322
Volcanic lakes 398
Volcanic plateaus 442, 443
Volcanism 428, 473, 488
impact on global environment 494
Mars and Moon 414
mechanics 491
mid-ocean ridges 444
subduction zones 448, 452
Volcanoes 3, 471, 488
cinder cone 490
composite 490
eruptions 491
flood basalt 489
greenhouse effect 175
impact on landscape 492
Mount Pelee 494
Mount St. Helens 492
pollution 98, 181
shield 489, 490
stratocone 490
types 489
Vesuvius 493
See also Supervolcanoes
Volga Delta, Caspian Sea 377
Vredefort impact crater 415
V-shaped valleys 550

W

Warm-blooded animals 242
Warm fronts
cyclones 130
weather conditions 132
Warm thermal anomalies 106
Wasatch Mountains, normal faulting 477
Washington 489
Waste, urban-industrial economies 19
Wastewater 404, 406
Water
as weathering agent 508
atmosphere 59
capillary 308, 345, 386
gravity 300, 302, 306, 345, 386
heat transfer 68
hygroscopic 301
loosely bound 301
molecular 300
origin of 336
phase changes 71
recycling 59
soil 300
tightly bound 301
total oceanic 17, 336
volumetric heat capacity 70, 94
Water-budget concept 343

© in this web service Cambridge University Press

CAMBRIDGE

Cambridge University Press
978-0-521-76428-5 - Physical Geography: Great Systems and Global Environments
William M. Marsh and Martin M. Kaufman
Index
More information

Water cycle 3, 4
See also Hydrologic cycle
Water gaps 548
Watering holes 347
Water mass, downwind transfer 100
Water resources, human impact 406
Watershed systems 367, 370, 376, 382
and streamflow 382
and urban development 371
as sediment system 543
external (open) 376
Great Watersheds 377
hierarchy 5, 368
internal (closed) 376
landforms 547
shape 370
water-budget model 344
Water supply, global 405
Water system. *See* Hydrologic system
Water table 387
Water use 403
consumptive 405, 406
degrading 406
non-consumptive 406
USA 403
Water vapor 115
atmosphere 4, 11, 58, 59
evapotranspiration 302, 303
global distribution 137
greenhouse gas 182, 190
source of 338
Water-vapor precipitation system 114
Wave base 565
Wave crest 564
Wave-cut notch 570
Wave-cut terraces 577
Wave-energy 566
Wave erosion 569
Wave height 564
Wavelength 564, 565
electromagnetic radiation 39
Wave mixing 100
Wave period 565
Waves
breaking 564, 565, 566
delta erosion 546
forms and motion 564
oscillatory 565
refraction 567
size 564
translatory 565
velocity 565
wind-generated. *See* wind waves
Wave systems 506, 507
Weathering 209
and bioclimate 509
bedrock 297
biological 511
chemical 508, 511
landforms 515
limestone 394
mechanical 511, 513
processes 511
soil 316, 324
solution 570
spheroidal 514
Weathering systems 508
global variation 510
hierarchy 5
Weather stations. *See* Automated Surface Observing Sites
Wedge islands 447, 457
Weeds, habitat amplitude 238
Wegener, Alfred (1880–1930), continental drift 439
Wells, groundwater 385, 391, 392
West-coast climate 157, 162, A6
West-coast forests 254
Westerly wind system 98, 101, 618
Gulf Stream 103
West-wind drift 101
Wet adiabatic cooling 119
Wet adiabatic lapse rate 119
Wetland systems 401
and land use 547
composite 401, 402
drainage 281
Dutch engineering 282
groundwater 401
impact on drainage networks 370
oxbow 542
riparian 401, 402
soil-forming regimes 317, 325, 326
surficial 401
Wet monsoon A4
Wet-terrace farming 268, 280
Whales, migration 243
Wheat
early agriculture 273
selective breeding 277, 279
Whitman, Walt (1819–1892) *Leaves of Grass* 9
Widening, valleys 541
Wien's law 40
Wilting point 301
Wind 84
adiabatic 123
cities 188
destabilizing force 4
erosion 4, 620
landforms 622
force and resistance 617
geostrophic 92
high altitude 92
katabatic 124
solar 37, 38
speed 86
velocity 617
Windcatcher ventilation system 164
Wind shear 127
Wind systems 506, 507, 613
equatorial and tropical zones 95
geographic patterns 618
global 3, 85, 87
high-latitude zone 99
midlatitude zones 98
surface 90, 94, 614
Wind waves 100, 560, 562
generation 563
Winter monsoon 95, 97, A4
Winter, onset of 20
Winter solstice 44, 45
and day length 65
sun angle 64
Wisconsinan glacial substage 603
Wolf, domestication 274
Wool clothing 165
Work 34, 47

X

Xerophytes 235, 257, 258
Xylem 232

Y

Yangtze River
average discharge 341
sediment output 544
Three Gorges Dam 376, 407, 553
watershed 378
Yardangs 622
Yellow River
gullying 331
sediment output 544
Yellowstone National Park
hotspot 461
supervolcano 492, 495
Yenisey River
average discharge 341
watershed 378
Youthful stage, geographic cycle 550

Z

Zambezi River, watershed 378, 379
Zero, absolute 48, 49

© in this web service Cambridge University Press www.cambridge.org