

Index

- adiabatic 316, 323
- adimensional numbers
 - Burger number 54, 60, 104
 - Ekman number 58, 85, 107, 154, 215
 - Froude number 14, 17, 23, 49, 215–217, 219, 270, 296, 386
 - Peclet number 17
 - Prandtl number 57, 60, 63, 85, 102, 104, 144
 - Rayleigh number 341, 343, 345, 368
 - Reynolds number 17, 217, 252–253, 368, 386
 - Richardson number 16, 189, 191–192, 194, 216–217, 219, 231, 253, 298, 361, 382–383
 - Rossby number 58, 226, 229, 232
- ash 358–361, 363, 368
- atmosphere 7, 134, 138, 249, 252, 312, 339
 - atmosphere-ocean exchange 250
 - atmospheric boundary layer 252, 312
 - atmospheric buoyancy-driven flow 312, 333
 - atmospheric convection 323, 326, 329, 333
 - atmospheric deep convection 319
 - atmospheric flow 312, 318
 - atmospheric front 319, 323
 - atmospheric simulation, model 331, 335
 - stratosphere 312
 - tropopause 312
 - troposphere 312, 320
- avalanche 8, 373, 381, 384, 397, 410
 - flowing avalanche 374
 - powder snow avalanche 374, 379–381, 383
 - snow avalanche 372–374, 389, 421
- Azores current 295
- baroclinic
 - baroclinic boundary layer 128
 - baroclinic current 99, 156
 - baroclinic instability 147, 160, 215, 230, 282–283, 319
 - baroclinic wave 315, 319
- barotropic
 - barotropic boundary current 156, 185, 207
 - barotropic flow 273
 - barotropic instability 215
 - barotropic Rossby wave 320
- Benjamin's theory 25
- beta-effect, beta-plane 80–81, 92–93
- boundary condition 288, 375
 - lateral boundary, sidewall boundary 72, 102, 105–106, 120, 291
- boundary current 124, 147, 156, 160
- boundary layer 59, 72, 81, 90, 106–107, 116, 153–154, 156, 222, 252, 255, 277, 291
 - bottom boundary layer (BBL) 291, 294, 301
 - Munk boundary layer 84
 - ocean boundary layer 257–258
 - viscous boundary layer 143
- Boussinesq 16, 98, 287–288
 - non-Boussinesq 372–373, 383
- buoyancy driven flows, buoyancy forced flows 1, 101, 119, 241, 253, 268, 281, 283, 295, 306, 313, 315
 - buoyancy flux 225, 229, 253, 269
 - buoyancy forcing 80, 118, 153, 229, 240, 251, 257
 - buoyancy frequency 54
 - buoyancy gradient 231
 - buoyancy layer 63, 65, 68, 151, 254, 257
 - buoyancy loss 118, 252
 - buoyant coastal current 4, 5, 165, 170, 181–182, 188, 200
 - buoyant gravity current 165
 - buoyant plume 164, 167, 171, 174, 177, 185, 188–189, 196–197, 356, 366
 - neutral buoyancy 221, 227, 326, 358
 - surface buoyancy forcing 52, 247–248, 252
- channel 103, 112, 153, 156, 208, 300
- Chesapeake bay 175–177, 180, 182, 186–187, 196–197, 199
- climate 8, 52, 142, 164, 240–241, 251, 258, 267, 271, 277, 313
 - climate model 220, 240–241, 242, 249–250, 258, 261, 268–269, 271, 281–282, 331
- cloud 319, 328, 333, 335
- coastal current 164, 175, 178
 - continental shelf 164, 209, 268, 270
- compressibility 340–341

- computational resources 241
- convection 121–122, 227, 231, 233, 227–228, 252, 255, 257–258, 267–268, 313, 315, 323–324, 328, 334, 341, 343–344, 347, 349, 354, 368
- convective flow 229
- convective instability 327
- convective plume 223, 233
- deep convection 130
- cooling 92, 110, 120, 144, 151, 155, 165, 203, 255–257, 316, 329, 339, 343, 346, 348, 352
- coordinate
 - isopycnic-coordinate 289, 292–293, 300
 - sigma-coordinate 289, 292
 - vertical coordinate 289, 332
 - z-coordinate 289, 292–293
- Coulomb model 418–420
- crust 339–341, 347
 - crustal rock 338
- crystallization, crystal 339, 343, 345–346, 348, 352
- debris flow 372–375, 384, 388, 421
- diffusion, diffusivity 84, 89, 91, 144, 159, 219, 246, 254, 291, 296–297, 333, 335, 343
 - horizontal diffusion 83, 144, 298
 - diffusive regime 387
- dissipation 118, 143, 161, 207, 292
 - viscosity, viscous dissipation 104, 113, 144, 154, 161, 159, 291, 350, 355
- downwelling 142, 146, 151, 154, 159, 185
- eddies 147, 207, 209, 215, 281, 291, 315, 366, 381
 - eddy diffusivity 229, 254
 - eddy dynamics 288
 - eddy flux 128, 137, 146, 161
 - eddy heat flux 129, 136
 - eddy-induced vertical velocity 148
 - eddy kinetic energy 145, 299, 334
 - eddy-permitting ocean model 285, 287
 - eddy-resolving ocean model 240–241, 287, 292, 300, 306
 - meddies 304
 - mesoscale eddies, mesoscale 83, 223, 231–232, 234, 244, 282–283, 325, 328–329, 334
- Ekman layer 5, 60, 70, 77, 154–155, 222–223
- Ekman transport 141, 167
- entrainment 193, 207, 212–213, 216, 224, 269–270, 273, 286, 293–294, 296, 304–305, 357–358, 382, 395, 408
 - entrainment velocity 212, 224
- detrainment 220
- eruption 339–340, 347, 355–358, 361, 368
 - hydrothermal eruption 364
 - submarine eruption 361
- evaporation 243, 247, 326
 - precipitation 247, 326, 336
- flow regimes 385
 - inertial regime 387, 406
 - nearly steady uniform regime 387
 - visco-inertial regime 387
- forcing 52, 271
 - surface forcing 243, 246, 251
- fresh water 165, 246–247, 251
 - fresh river water 164
 - fresh water flux 243, 248
- friction 59, 210, 214
 - bottom friction 214, 222, 300
- front, frontogenesis 14, 180, 319, 323
- gas bubble 339, 349–351, 366–367
- geostrophy 97, 103, 110, 114, 116, 152, 157–158, 169, 204, 206, 214–215, 233, 270, 315
 - ageostrophy 113, 156, 168–169, 323
- gravity current, gravity current speed 13, 49, 328, 375, 383
 - gravitational acceleration 372
 - gravity waves 50
- Gulf of Cadiz 295, 302–304
- gyre
 - subpolar gyre 92, 283
 - subtropical gyre 92, 134, 256
- Hadley cells 313–314, 319, 329
- heating 70, 76, 92, 110, 119, 246, 343
 - heat budget 132
 - heat flux 134–135, 138, 228, 243–244, 247–248, 343
 - heat flux parametrization 135
 - heat loss 137, 155
 - heat source 313
 - heat transfer 343
 - heat transport 131, 133, 277
- Herschel-Bulkley model 390, 399, 415
- hydrostatic, hydrostatic balance 64, 104, 159, 165
 - hydrostatic equation, hydrostatic approximation 97, 287–289, 312, 315, 317, 332, 334
 - hydrostatic layer 65, 89, 91, 94
 - non-hydrostatic 144, 154, 159, 333
- instability 213, 230, 302, 304, 383
- isopycnal 123, 233, 255, 291
- Kelvin-Helmholtz instability 213, 297, 408
- laboratory experiment, laboratory model 13, 56, 76, 171, 182, 338, 352, 367, 375, 377, 381, 383, 390, 413
 - rotating tank 171
- Labrador sea 124, 128–129, 133, 146, 165, 227, 252, 275, 281
- land-sea breeze, mountain breeze 330
- large-eddy simulation (LES) 240, 252
- leading edge 380, 396
- linear problem, linear theory 58, 129
 - nonlinear theory 97
- magma 339–340, 342–343, 347, 349–350, 352, 355
 - magma chamber 338, 345, 350, 354
 - magma reservoir 338, 340, 348, 352
- marginal sea 118, 120, 122, 130, 138, 140, 160, 267–268, 281

- mixed layer 125, 252, 256
 mixing 209, 214, 233–234, 252, 292, 296, 298–299,
 313–314, 324, 333, 358, 367, 383
 diapycnal mixing 142, 144, 219, 293–294
 vertical mixing 83, 165, 193, 250, 291, 296, 298
 model 81, 170, 195, 200, 217, 240, 248, 271–272, 277,
 287–289, 302, 343, 356–357, 359, 363, 394, 397
 coupled model 249, 266, 271, 287–288
 model resolution 251, 268–269, 271, 277, 283–286,
 290, 292, 300, 303–305, 331–333, 336
 numerical model 103, 119, 151, 171, 174–175, 182,
 188, 191, 195, 251, 281, 283, 286, 292,
 296–297
 primitive equation 244, 287
 two-layer model 81–82
- Newtonian fluid 388
 non-Newtonian fluid 388, 393
- Nordic seas 135, 146, 251, 268, 272, 275–276, 281, 293
- North Atlantic ocean 135, 251, 283, 293
- numerical scheme 288, 293, 301, 304
- observation, field data 178, 186, 256, 258, 272, 275,
 281, 287, 299, 303, 306, 319, 334, 381, 383, 393,
 417
 ARGO 264
 float 283
 ocean observation 175, 274
- ocean general circulation model (OGCM) 119, 244,
 246, 248–253, 256, 258, 264, 267–277
- oceanography, ocean 1, 81, 138, 166
 oceanic circulation 92, 134
 open ocean 134, 160
 open ocean convection 121
- operational oceanography, atmospheric operational
 model 287, 331
- overflow 5–6, 203, 223, 233, 251, 267–270, 275–276,
 278, 281, 284, 286–287, 289, 293–294, 297, 301,
 303
 Antarctic overflow 209
 Denmark strait overflow 6, 204, 268–269, 272–273
 dense overflow 203
 Faroe Bank channel overflow 207, 268–269, 272–273
 Mediterranean overflow 208, 270–271, 285, 287,
 295, 300, 302, 304–305
 Red Sea overflow 207
- overturning circulation, meridional overturning
 circulation 101, 133, 142, 156, 165, 203, 242, 251,
 258, 264–266, 268, 274–275, 294
- parameterization 216–218, 232, 244, 251, 267–270, 272,
 275, 278, 288, 291–294, 301, 303–306, 332, 334
- plume 167–168, 172–174, 176, 187–188, 191, 195,
 206–207, 221, 223, 225, 227, 233, 281, 295, 304,
 306, 323–324, 351–352, 365–366
 hydrothermal plume 366
 Mississippi River plume 198–199
 river plume 164
- polar regions 101
- predictability, prediction 332–333, 357
- pressurization, pressure 338–340
- pycnocline 257, 267
- reduced gravity 2, 15, 167, 204, 269, 281
- rheology 372, 388–389
- Romanche fracture zone 287, 295–296, 300
- Ross sea 209, 268
- Rossby radius of deformation 55, 99, 102, 144, 208,
 281, 283, 315, 319
- Rossby wave 84, 86, 94, 99, 295, 315
- rotation, Earth's rotation 2, 3, 52, 164–165, 211, 214,
 227, 252, 312, 319, 323
 non-rotating 53
- Saint-Venant equation 395, 398–400, 421
- salinity, salt 179, 181–182, 186–187, 203, 243, 248,
 253–254, 256, 263–264, 270–271, 273, 284, 295,
 300–304
- scaling analysis 18, 384–385
- sea-ice 249
- shallow-water theory 38
- shear instability, shear stress 214, 403
- sill 135, 138, 204, 299
- similarity phase, similarity theory 19, 254
- sloping topography, sloping bottom, bottom slope 122,
 128, 164–165, 169–170, 281, 300
 steep topography 132
 topography, bottom topography, bathymetry 4, 123,
 161, 203, 211, 268–271, 273, 289–290, 294,
 303, 306
 topographic wave 209
- solar radiation 251
- Stewartson layer 154
- strait of Gibraltar 6, 208, 268–269, 271, 286, 300
- stratification 80, 101, 143–144, 161, 233, 255, 312, 358,
 382
 restratification 127
 rotating stratified fluid 52
 stratification parameter 85
 stratified fluid 43, 47, 118
 strong stratification 123
 weak stratification 101, 103, 118, 150–151, 161
- Sverdrup 85, 89
- Taylor-Proudman theorem 53, 70
- temperature 139–140, 252, 256, 264, 270, 273, 295,
 297, 301, 346, 348, 374
 potential temperature 316–317
 sea-surface temperature 125, 249–250
- thermohaline circulation 241–242
- tide 208–211
- turbulence 210, 213, 240, 252–255, 292, 296, 299, 324,
 333, 344, 359, 361, 364, 368, 412
 turbulent wake 380
- ventilation 261, 264–265, 267, 274
- vertical
 vertical motion, vertical velocity 52, 80, 118, 146,
 148–149, 151, 156, 161, 298, 316–317, 332
 vertical resolution 289, 293, 299, 305

Cambridge University Press

978-1-107-00887-8 - Buoyancy-Driven Flows

Edited by Eric P. Chassignet, Claudia Cenedese and Jacques Verron

Index

[More information](#)

436

Index

viscoplastic 390, 403–404

volcanic flow, volcano 7, 338–339, 360–361, 368, 373

melting 338

molten rock 338

vorticity 102, 150, 295

potential vorticity 55, 98, 231, 320

water mass 8, 127, 141, 160, 203, 210, 234, 281,

283–284

deep water 165, 251, 288

dense current, dense water 6, 203, 206, 209–210

estuarine water 164

Weddell sea 209, 268

wind forcing 135, 141, 164, 182, 187, 191, 193, 277

alongshore wind 185

katabatic wind 329–330

upwelling wind 185, 187

wind-driven circulation 142, 266, 277

wind-driven entrainment 200