

Cambridge University Press

978-0-521-13133-9 - Large Eddy Simulation of Complex Engineering and Geophysical Flows

Edited by Boris Galperin and Steven A. Orszag

Index

[More information](#)

Index

- adjustment
 - convective, 498
 - dynamic, 498
- anisotropic flows, 129
- anticipated potential vorticity
 - method (APVM), 590
- approximate boundary
 - condition, 121, 560
- average
 - cascade, 516–17
 - conjunctive, 517
 - double, 516–17, 526
 - Favré, 244, 260, 316, 318
 - low-pass, 517, 521, 531
 - moving, 516, 528
 - phase, 373, 377
- Reynolds, 38, 55, 129, 160,
193, 209, 316, 322, 513,
528, 559, 562
- bathymetry, 513
- beta density, 330, 334–42
- bulk, 67, 390, 451, 491, 500
 - formulas, 493–5, 500
 - parameterizations, 499
 - Kraus and Turner, 499
 - Price, 507
- Burgers equation, 516
- cache flow, 574
- climate simulation models, 578–9
- communications overhead,
583–4, 587
- compressible hydrodynamics,
105–13, 232, 573
- computational intensity, 586–8
- condensation processes, 6
- convection
 - cumulus, 581, 587
 - free, 497–8, 444
 - nonpenetrative, 407
 - penetrative, 444, 581
 - slant-wise, 7, 28
 - two-dimensional, 405
- Coriolis parameter, 426–9, 437
- cross terms, 120–2, 262–3, 516,
523, 529, 531, 540–55
- deformation, tensor, 531
- diffusion flames, 288, 292, 299
- direct interaction approximation
(DIA), 79–82, 92, 95, 123, 197,
257, 288, 292, 299
- distributed memory, 580, 582

- domain decomposition, 581–2
 - /message passing (DDMP), 572–3, 584–92
- eddies
 - baroclinic, 434, 590
 - mesoscale, 455, 476–7
 - synoptic oceanic, 426–7
- eddy-damped quasi-normal
 - Markovian approximation (EDQNM), 44, 81, 107, 180
- eddy diffusivity, 141–3, 146, 149, 152, 180, 182, 184, 245, 288, 351, 357, 359–61, 459
 - for passive scalar, 155
- Ekman layer, 443, 445
- elasticity theory, 9–10
- enstrophy, 6, 85–6, 96, 99, 182
 - potential, 432, 591
- entrainment velocity, 491
- entropy, 434–5
 - maximum, 432–7
- Erie, Lake, 515
- Esperanto, 573
- filter
 - analog, 516, 524, 530
 - anisotropic, 42, 516, 541
 - box, 263, 321, 336
 - Gaussian, 541–5, 547, 552
 - conjunctive, 517, 535
 - cutoff, 126
 - digital, 516, 525, 530
 - double, 47
 - Favré, 121, 243, 260, 300, 304
 - Gaussian, 126–7, 163, 194, 199, 201, 243, 401, 518–20, 544, 553
 - grid, 128, 218
 - high-pass, 143, 517–19, 529–32
 - isotropic, 42, 516, 533, 541
 - Gaussian, 544
 - low-pass, 257, 517–18, 523–4, 530, 532, 591
 - sharp spectral cutoff, 146, 149, 212
 - space, 541–2
 - space–time, 516, 518
- symmetric, 521–2, 527–8
- test, 128, 143, 147, 150, 218, 244
- top-hat, 194, 199
- forward scatter, 121, 131, 213–14
- free surface, stability, 515
- full-field, 147, 149
- general circulation model (GCM), 4, 6–7, 22, 349, 492, 588
 - atmospheric (AGCM), 578, 587–9, 592
 - oceanic (OGCM), 455–8, 476–7, 481, 578
- geostrophic turbulence, 6, 8, 28, 80
- greenhouse gas, 579
- heat flux
 - convergence, 489
 - poleward, 457–8
 - residuals, 495
 - surface, 404, 491–3, 496, 500, 505–7
 - transverse, 478–9
- Heisenberg constant, 16
- Heisenberg–Kolmogorov similarity, 5
- Helmholtz decomposition, 232, 237, 241
- index cycle, 3
- inertial motions, 497
- inertial subrange, 5–6, 16–19, 24–5, 107, 122, 426
- instability, 182, 188
 - baroclinic, 3, 6, 9, 29, 477–81, 590
 - combustion, 76
 - convective, 456
 - dynamic, 498
 - gravitational, 473
 - helical-pairing, 186
 - hyperscale, 57
 - Kelvin–Helmholtz, 108
 - linear Courant–Friedrich–Lewy (CFL), 4, 591

- mean flow, 497
 nonlinear, 4
 numerical, 4, 73, 110
 parametric subharmonic (PSI), 469–70
 Rayleigh–Taylor, 115
 secondary, 57, 129, 186, 214, 220
 shear, 443, 456, 474, 497–8
 static, 498
 thermobaric, 442
 waves, 259
- interprocessor communications, 579, 582
- jet stream, 6–7, 27, 31
- Langmuir circulations, 497–8
 Lax–Wendroff algorithm, 108, 110, 113, 115
 Leonard
 approximation, 540–3, 546, 548, 553–5
 stresses, 120, 122, 256, 261–3
 terms, 195, 197, 205, 256, 521, 527, 529, 535, 540, 542
 Leonard–Clark closure, 521, 527
 linear eddy model, 288, 291, 297
 implementation, 292
 flame propagation, 292, 294
 molecular diffusion, 292
 thermal expansion, 292, 295
 turbulent stirring, 293
 subgrid formulation, 298–304
 splicing process, 300–9
 triplet map, 293–4
 Livermore model, 574–5
 load, 579
 balance, 583, 585
 computational, 570, 581
 direct, 581
 imbalance, 581
 log-layer, 150, 155
- massively parallel computing, (MPC), 38, 298, 312, 569, 571, 578–9, 593
- architectures, 578
 message-passing, 114, 571–2, 584
 microprocessors, 569–71, 574, 577, 579
 monsoon, 6
 multiple instruction, multiple data (MIMD), 570–2, 574, 580–2
- Neptune effect, 428, 431, 433, 439
 numerical weather prediction (NWP), 3, 494, 579, 581, 586, 594
- Nusselt number, 150, 152, 155, 566
- ocean mixed layer (OML), 489–91, 497, 499, 500, 504–7
- passive scalar, 119, 141, 150–1, 181, 322, 358, 446
 in channel flow, 149, 153–4, 156
 fluxes, 147, 152, 359
 in homogeneous shear flow, 148, 151
 mean profiles, 151, 153
 variance, 108
- planetary boundary layer (PBL), 350–9, 382, 441–52, 489, 497–506
- Prandtl, 41
 layer, 402
 mixing length, 19–20
 number, eddy, 88–9, 112
 number, molecular, 99, 148
 number, turbulent, 142, 147–9, 159, 180–2, 262, 450
 spectral, 183
- premixed flames, 74–5, 288, 291, 312
 flamelets, 295–6, 306–7
 G-equation, 290
 thin flame model, 290–1, 294–5
- probability density function (PDF), 316–20, 322–3, 329–30, 334–7, 339, 342–3
 closure, 336, 339

- DNS-generated, 330, 341
- Gaussian, 332–3
- guessed, method 322–3
- methods, 317
- moment method, 317
- multipoint, 319–20, 342
- one-point, 319–20, 330, 333, 341, 343
- prefiltering of, 321
- for subgrid models, 323, 335, 339–40, 342–3
- transport equation, 318–9, 323, 341–2
- process parallelism, 582
- radiative transfer, 493, 579, 581
- random acceleration, 110–11
- random coupling model (RCM), 82
- renormalization group (RNG), 24, 41, 43, 56–76, 89, 127–31, 159–61, 167–75, 212, 218–22, 257
- Richardson number, 402, 451, 456, 459, 466–8, 498, 500
- bulk, 500
- gradient, 451, 500
- Richardson’s law, 4
- rigid lid, 371, 409, 515
- Rossby deformation radius, 426, 434, 590
- roughness length, 443, 492
- scale similarity model, 43, 262
- sea ice, 442
- sea surface temperature (SST), 489–99, 505–6
- shallow water equations, 587
- shared memory, 394, 571–2, 580
- shear flow, 42, 48, 259, 288, 297, 353, 566
 - homogeneous, 147–8, 255
- shocklets, 52, 132, 188–9, 325, 328–9, 341
- shocks, 4, 22, 106, 110–11, 257, 329
- smooth, 44
- strong, 329
- waves, 52, 132, 211, 257–8
- signal processing, 518, 530, 534
- single instruction, multiple data (SIMD), 570–2, 580, 594
- storm, 3, 28, 51, 497, 500, 513
- structure function model, 126, 179–90
- test field model (TFM), 79–99, 124–6
- tests
 - a posteriori*, 126, 129, 195, 202, 205, 209, 212, 448, 560
 - a priori*, 122–3, 126, 128–9, 131, 141, 145–9, 195, 209, 257, 317, 323, 339, 341, 560
- topography, 373, 399, 427–30, 438, 444, 478, 480, 584
- turbulence closures
 - mapping, 333–5, 342–3
 - Mellor and Yamada (MY), 352
 - level 2, 503
 - level 2.5, 384, 491, 502–4, 506
- turbulence kinetic energy, (TKE), 109, 186, 290, 300, 370, 384–8, 499–505
- turbulent master length scale, 504
- turbulent shear flows, 259
 - experimental observations, 288
 - large-scale structure, 56, 80, 179, 287
- unmixedness, 339–40
- upwelling, 461, 491–2, 496, 505, 513
- wave number
 - cutoff, 84, 181, 524, 534
 - Nyquist, 530, 532, 534
 - orbital, 20
- waves
 - surface, 411, 413, 415, 497–8
 - topographic Rossby, 428
- wind stress, 428, 443–7, 501, 505–6