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Nota di contenuto	Finite Volumes Methods , Jerome Bouget Introduction Conservativity Control volume integration Grid General flux interpolation Resolution and time discretization Consistency, stability, and convergence Upwind interpolation Particular case of structured grids Boundary conditions Weighted Residuals Methods , Fabien Godeferd Introduction Principles of the weighted residuals method Collocation or pseudo-spectral method Least squares method Method of moments Galerkin approximation Subdomains An example Spectral Methods , Fabien Godeferd Introduction Linear problem: Galerkin, tau, and collocation methods Applications: Fourier Applications: Chebyshev Implicit equations Evaluation of nonlinear terms Smoothed-Particle Hydrodynamics (SPH) Methods , Francis Leboeuf and Jean-Christophe Marongiu Introduction SPH approximation of a function Properties of the kernel function W Barycenter of D(x i ) Choices of the kernel function W SPH approximation of differential operators applied on a function Using a Taylor series expansion Concluding remarks Application of SPH Methods to Conservation Equations , Francis Leboeuf and Jean-Christophe Marongiu General form of conservation equation Weak SPH-ALE formulation of the conservation equations

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Applications of SPH and SPH-ALE methods Finite Volume Particle  
Methods (FVPM) , Francis Leboeuf and Jean-Christophe Marongiu  
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multi-scales anisotropic mesh adaptation 3D goal-oriented anisotropic  
mesh adaptation Concluding remarks LES, Variational Multiscale LES,  
and Hybrid Models , Hilde Ouvrard, Maria-Vittoria Salvetti, Simone  
Camarri, Stephen Wornom, Alain Dervieux, and Bruno Koobus  
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multiscale large eddy simulation (VMS-LES) Hybrid RANS/LES  
Concluding remarks Numerical Algorithms for Free Surface Flow ,  
Alexandre Caboussat, Guillaume Jouve, Marco Picasso, and Jacques  
Rappaz Introduction A short review on two-phases flow with free  
surfaces Some preliminary remarks on ice and glacier modeling  
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discretization Modeling of interfacial effects Numerical results for liquid  
flow Numerical results for ice flow Concluding remarks Bibliography

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### Sommario/riassunto

This book concentrates on the numerical of computational fluid mechanics (including mathematical models in computational fluid mechanics, numerical methods in computational fluid mechanics, finite volume, finite difference, finite element, spectral methods, smoothed particle hydrodynamics methods, mixed-element-volume methods, free surface flow) followed by some focus of new development of classical methods, and to the recent methods appearing in this field. The topics covered in this book are wide ranging and demonstrate the extensive use in computational fluid mechanics. The book opens with a presentation of the basis of finite volume methods, weighted residual methods and spectral methods. These specific approaches are particularly important in the context of fluid mechanics, where they cover complementary domains of application. A unified point of view is introduced, based on the weighted residuals description. Chapter 1 presents the finite volume method. Chapter 2 describes the principles of weighted residuals methods. Chapter 3 introduces the spectral method. Chapter 4 presents computational fluid dynamics based on the smoothed particle hydrodynamics (SPH) method. Chapter 5 focuses on an improved SPH method based on an arbitrary Lagrange Euler (ALE) formalism. Chapter 6, using the similarity with the finite volumes method, introduces high order flux schemes between interacting points. Chapter 7 presents some numerical methods for compressible computational fluid dynamics. Chapter 8 deals with the prediction of turbulent complex flows as occur. Chapter 9 discusses the modeling and numerical simulation of free surface flows--

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