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equation Weak SPH-ALE formulation of the conservation equations Application to flow conservation equations Boundary conditions Applications of SPH and SPH-ALE methods Finite Volume Particle Methods (FVPM) , Francis Leboeuf and Jean-Christophe Marongiu Introduction Partition of unity Average of a function Derivatives of ? Conservation equation and FVPM Concluding remarks Numerical Algorithms for Unstructured Meshes , Bruno Koobus, Frederic Alauzet, and Alain Dervieux Introduction Spatial representation Toward higher spatial order Positivity of mixed element-volume formulations 3D 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 Introduction Numerical model Large eddy simulation (LES) Variational multiscale large eddy simulation (VMS-LES) Hybrid RANS/LES Concluding remarks Numerical Algorithms for Free Surface Flow , Alexandre Caboussat, Guillaume Jouvet, Marco Picasso, and Jacques Rappaz Introduction A short review on two-phases flow with free surfaces Some preliminary remarks on ice and glacier modeling Modeling Time splitting scheme A two-grids method for space discretization Modeling of interfacial effects Numerical results for liquid flow Numerical results for ice flow Concluding remarks Bibliography

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--