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| Autore | Gosse Laurent |
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| Soggetti | Differential equations, Partial<br>Computer science - Mathematics<br>Engineering mathematics |
| Lingua di pubblicazione | Inglese |
| Formato | Materiale a stampa |
| Livello bibliografico | Monografia |
| Note generali | Description based upon print version of record. |
| Nota di bibliografia | Includes bibliographical references and index. |
| Nota di contenuto | Introduction and chronological perspective -- Lifting a non-resonant scalar balance law -- Lyapunov functional for linear error estimates -- Early well-balanced derivations for various systems -- Viscosity solutions and large-time behavior for non-resonant balance laws -- Kinetic scheme with reflections and linear geometric optics -- Material variables, strings and infinite domains -- The special case of 2-velocity kinetic models -- Elementary solutions and analytical discrete-ordinates for radiative transfer -- Aggregation phenomena with kinetic models of chemotaxis dynamics -- Time-stabilization on flat currents with non-degenerate Boltzmann-Poisson models -- Klein-Kramers equation and Burgers/Fokker-Planck model of spray -- A model for scattering of forward-peaked beams -- Linearized BGK model of heat transfer -- Balances in two dimensions: kinetic semiconductor equations again -- Non-conservative products and locally Lipschitzian paths -- A tiny step toward hypocoercivity estimates for well-balanced schemes on 2x2 models -- Preliminary analysis of the errors for Vlasov-BGK. |
| Sommario/riassunto | Substantial effort has been drawn for years onto the development of (possibly high-order) numerical techniques for the scalar homogeneous conservation law, an equation which is strongly dissipative in L1 thanks |

to shock wave formation. Such a dissipation property is generally lost when considering hyperbolic systems of conservation laws, or simply inhomogeneous scalar balance laws involving accretive or space-dependent source terms, because of complex wave interactions. An overall weaker dissipation can reveal intrinsic numerical weaknesses through specific nonlinear mechanisms: Hugoniot curves being deformed by local averaging steps in Godunov-type schemes, low-order errors propagating along expanding characteristics after having hit a discontinuity, exponential amplification of truncation errors in the presence of accretive source terms... This book aims at presenting rigorous derivations of different, sometimes called well-balanced, numerical schemes which succeed in reconciling high accuracy with a stronger robustness even in the aforementioned accretive contexts. It is divided into two parts: one dealing with hyperbolic systems of balance laws, such as arising from quasi-one dimensional nozzle flow computations, multiphase WKB approximation of linear Schrödinger equations, or gravitational Navier-Stokes systems. Stability results for viscosity solutions of onedimensional balance laws are sketched. The other being entirely devoted to the treatment of weakly nonlinear kinetic equations in the discrete ordinate approximation, such as the ones of radiative transfer, chemotaxis dynamics, semiconductor conduction, spray dynamics of linearized Boltzmann models. “Caseology” is one of the main techniques used in these derivations. Lagrangian techniques for filtration equations are evoked too. Two-dimensional methods are studied in the context of non-degenerate semiconductor models.