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Abstracts of Papers to Appear in Future Issues

A STOCHASTIC WEIGHTED PARTICLE METHOD FOR THE BOLTZMANN EQUATION. Sergej Rjasanow* and Wolfgang Wagner†. **University of Kaiserslautern, Department of Mathematics, Postfach 3049, D-67653 Kaiserslautern, Germany; and †Weierstrass Institute for Applied Analysis and Stochastics, Mohrenstrasse 39, D-10117 Berlin, Germany.*

A class of algorithms for the numerical treatment of the Boltzmann equation is introduced. This class generalizes the standard direct simulation Monte Carlo method, which is contained as a particular case. The new algorithms use a more general procedure of modelling collisions between particles. This procedure is based on a random weight transfer from the particles with the precollision velocities to the particles with the postcollision velocities.

A CHEBYSHEV PSEUDOSPECTRAL MULTIDOMAIN METHOD FOR A BOUNDARY-LAYER PROBLEM. Francesco Malara. *Dipartimento di Fisica, Università della Calabria, 87030 Cosenza, Italy.*

A multidomain pseudospectral method, which is based on Chebyshev polynomials expansions, is presented to solve an initial-boundary value problem in incompressible MHD, the tearing instability, in which a boundary layer is spontaneously generated inside the spatial domain. The method is based on a property of Chebyshev pseudospectral expansions which accurately describe functions having strong gradients localized near one of the Chebyshev domain boundaries. A comparison with the results of a single-domain pseudospectral method is performed, showing that, in the considered case, the multidomain technique furnishes a higher accuracy keeping the truncation error to a lower level. Because of the steeper Chebyshev spectra lower aliasing errors are obtained during the nonlinear stage of the instability.

A COMPARATIVE STUDY ON METHODS FOR CONVERGENCE ACCELERATION OF ITERATIVE VECTOR SEQUENCES. V. Eyert. *Max-Planck-Institut für Festkörperforschung, Heisenbergstraße 1, D-70569 Stuttgart, Germany.*

We discuss several methods for accelerating the convergence of the iterative solution of nonlinear equation systems commonly in use and point to interrelations between them. In particular we investigate two of the most sophisticated schemes, namely the Anderson mixing and the Broyden update, both generalized to the consideration of arbitrarily many previous iterations. For the Broyden method we give a new derivation which is much simpler than that recently proposed by Vanderbilt and Louie. We show that if the additional parameters invented by these authors in order to increase flexibility are used to optimize the convergence of the iteration process they in fact cancel out. In addition we prove that in this (optimal) case the Anderson mixing and the Broyden update as applied to the inverse Jacobian are fully identical. Thus we come to the conclusion that neither of these schemes is superior. Moreover, we show that Broyden update of the inverse Jacobian is superior to updating the Jacobian itself. Finally we propose an extension of the Anderson mixing which avoids the numerical difficulties all these methods are faced with.

AN APPROXIMATE LINEARIZED RIEMANN SOLVER FOR A TWO-FLUID MODEL. I. Toumi* and A. Kumbaro†. **Commisariat à l'Energie Atomique, Centre d'Etudes de Saclay, DMT/SERMA, Gif-sur-Yvette, 91191, France and †Electricité De France, DER/PhR, 1, av. du Général de Gaulle, Clamart, 92140, France.*

An approximate linearized Riemann solver is presented for the numerical simulation of two-phase flows. This new solver is based on a linearization of nonconservative products and uses an extension of Roe's approximate Riemann solver. The scheme is applied to shock tube problem and to a standard test for two-fluid codes.

ON NONSMOOTH SOLUTIONS OF LINEAR HYPERBOLIC SYSTEMS. Knut S. Eckhoff and Jens H. Rolfsnes. *Department of Mathematics, University of Bergen, Johs. Brunsgt. 12, N-5008 Bergen, Norway.*

Initial value problems for linear hyperbolic systems with smooth 2π-periodic coefficients are solved numerically by a modified Fourier–Galerkin method when the initial values are nonsmooth. The described approach is seen to give substantially improved accuracy compared to more traditional methods. The discontinuities are accurately resolved already on coarse grids, and the fine-structure of structured solutions is resolved on relatively coarse grids as well. The accuracy is seen to be of high order and, even for very long term integrations, the global error can be kept very small if the grid is sufficiently refined.

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