JOURNAL OF COMPUTATIONAL PHYSICS **99**, 351–352 (1992)

Abstracts of Papers to Appear in Future Issues

TWO-GROUP APPROACH TO THE KINETICS OF PARTICLE CLUSTER AGGREGATION. M. Vicanek and N. M. Ghoniem. *University of California, Los Angeles, Los Angeles, California 90024, USA.*

We present a numerical scheme for the treatment of particle agglomeration phenomena. The method is based on separating clusters into two groups according to size: small clusters containing up to x^* atoms and larger clusters with more than x^* atoms. In the first group, a set of equations describes the evolution of individual clusters; moment equations are derived for the second group. These two sets of coupled equations are solved numerically for, and giving good agreement with, a case where an exact solution is available. In a second step, the full distribution function is reconstructed from its moments. Here we use a nonlinear method based on the maximum entropy principle. The superiority of this method over a Gram–Charlier expansion is demonstrated for an example taken from the condensation of atomic clusters on a surface.

SOLUTION OF SIMULTANEOUS PARTIAL DIFFERENTIAL EQUATIONS USING DYNAMIC ADI: SOLUTION OF THE STREAMLINED DARWIN FIELD EQUATIONS. D. W. Hewett, D. J. Larson, and S. Doss. *University of California, Lawrence Livermore National Laboratory, Livermore, California 94550, USA.*

We apply a particular version of ADI called Dynamic ADI (DADI) to the strongly coupled 2nd-order partial differential equations that arise from the streamlined Darwin field (SDF) equations. The DADI method is applied in a form that we show is guaranteed to converge to the desired solution of our finite difference equations. We give overviews of our test case, the SDF problem, and the DADI method, with some justification for our choice of operator splitting. Finally, we apply DADI to the strongly coupled SDF equations and present the results from our test case. Our implementation requires a factor of 7 less storage and has proven to be a factor of 4 (in the worst case) to several orders of magnitude faster than competing methods.

MULTI-DOMAIN CHEBYSHEV–FOURIER METHOD FOR THE SOLUTION OF THE EQUATIONS OF MOTION OF DYNAMIC ELASTICITY. Ekkehart Tessmer. *Institut für Geophysik, Universität Hamburg, D 2000 Hamburg, Germany*; David Kessler. *Tel Aviv University, Tel Aviv, Israel 69978*; Dan Kosloff. *Institut für Geophysik, Universität Hamburg, D 2000 Hamburg, Germany, and Tel Aviv University, Tel Aviv, Israel 69978*; Alfred Behle. *Institut für Geophysik, Universität Hamburg, D 2000 Hamburg, Germany.*

A multi-domain approach for the solution of the equations of elasticity in two spatial dimensions is presented. The equations of momentum conservation and the stress–strain relations are recast as a system of five coupled equations in time in which the particle velocities and the stresses are the unknowns. Solution schemes for both 2D Cartesian and polar coordinates are derived. In both cases the solution is assumed periodic in one coordinate (the x or θ directions) and nonperiodic in the other direction. The numerical algorithm uses a Fourier expansion in the periodic direction and domain decomposition and a modified Chebyshev expansion in the remaining direction. The multi-domain approach is tested against problems with known solutions. In all cases it appears as accurate as solutions with a single domain. The multi-domain concept adds flexibility and improves efficiency. It allows use of different grid sizes in different regions depending on the material properties and allows a relatively uniform grid spacing in the polar coordinate case.

COMPARISON OF COORDINATE-SPACE TECHNIQUES IN NUCLEAR MEAN-FIELD CALCULATIONS. V. Blum. *Institut für Theoretische Physik der Universität Frankfurt a.M., Robert Mayer-Strasse 10, 6000 Frankfurt a.M. 11, Germany*; G. Lauritsch. *Institut für Theoretische Physik der Universität Erlangen/Nürnberg, Staudstrasse 7, 8520 Erlangen, Germany*; J. A. Maruhn. *Institut für Theoretische Physik der Universität Frankfurt a.M., Robert Mayer-Strasse 10, 6000 Frankfurt a.M. 11, Germany*; P.-G. Reinhard. *Institut für Theoretische Physik der Universität Erlangen/Nürnberg, Staudtstrasse 7, 8520 Erlangen, Germany.*

We investigate three different numerical representations for nuclear mean-field calculations: finite differences, Fourier representation, and basis-splines. We compare these schemes with respect to precision and speed. It turns out that Fourier techniques and basis-splines are much superior in precision to finite differences. The Fourier representation in connection with the fast Fourier transformation is advantagous for large grids whereas matrix techniques, derived either from basis-splines or from Fourier representation, are preferable for smaller grids.

APPROXIMATE SOLUTIONS TO THE ZAKHAROV EQUATIONS VIA FINITE DIFFERENCES. R. T. Glassey. *Indiana University, Bloomington, Indiana 47405, USA.*

An energy-preserving, linearly implicit finite-difference scheme is presented for computing solutions to the periodic initial-value problem for the Zakharov equations. Solitary waves and colliding solitary waves are computed, and a comparison is made with previous calculations.

UPWIND MONOTONIC INTERPOLATION METHODS FOR THE SOLUTION OF THE TIME DEPENDENT RADIATIVE TRANSFER EQUATION. James M. Stone. *Department of Astronomy and the National Center for Supercomputing Applications, University of Illinois at Urbana-Champaign, Urbana, Illinois 61801, USA*; Dimitri Mihalas. *Department of Astronomy, University of Illinois at Urbana-Champaign, Urbana, Illinois 61801, USA.*

We describe the use of upwind monotonic interpolation methods for the solution of the time-dependent radiative transfer equation in both optically thin and thick media. These methods, originally developed to solve Eulerian advection problems in hydrodynamics, have the ability to propagate sharp features in the flow with very little numerical diffusion. We consider the implementation of both explicit and implicit versions of the method. The explicit version is able to keep radiation fronts resolved to only a few zones wide when higher order interpolation methods are used. Although traditional implementations of the implicit version suffer from large numerical diffusion, we describe an implicit method which considerably reduces this diffusion.

0021-9991/92 $3.00