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Abstracts of Papers to Appear in Future Issues

A 1D EXACT TREATMENT OF SHOCK WAVES WITHIN SPECTRAL METHODS IN PLANE GEOMETRY. Silvano Bonazzola and Jean-Alain Marck, *Groupe d'Astrophysique Relativiste, Observatoire de Paris, Section de Meudon, F-91195 Meudon Principal Cedex, FRANCE.*

We present a very exact numerical technique for solving 1D Euler equations coupled with the transport equations for the entropy and the chemical abundances with or without shock formation. Two moving grids are used before and after the shock formation. Quantities are expanded on both sides of the matching point in Chebychev polynomials series. After the shock is formed, Rankhine–Hugoniot conditions are used to determine the velocity of the shock and the matching conditions across the shock. Typical results are presented.

IMPLICIT SPECTRAL METHODS FOR WAVE PROPAGATION PROBLEMS. Stephan B. Wineberg, *KMS Fusion, Inc., P.O. Box 1567, Ann Arbor, Michigan 48106, U.S.A.*; Joseph F. McGrath, *Mechanical Dynamics, Inc., Ann Arbor, Michigan 48106, U.S.A.*; Edward F. Gabl, *Department of Physics, Eastern Michigan University, Ypsilanti, Michigan 48176, U.S.A.*; L. Ridgway Scott, *Department of Mathematics, University of Houston, Houston, Texas 77004, U.S.A.*; Charles E. Southwell, *Department of Mathematics, Michigan Technological University, Houghton, Michigan 49931, U.S.A.*

The numerical solution of a non-linear wave equation can be obtained by using spectral methods to resolve the unknown in space and the standard Crank–Nicolson differencing scheme to advance the solution in time. We have analyzed iterative techniques for solving the non-linear equations that arise from such implicit time-stepping schemes for the K-dV and the K-P equations. We derived predictor-corrector methods that retain the full accuracy of the implicit method with minimal stability restrictions on the size of the time step. Some numerical examples show the propagation of interacting solitons.

THE METHOD OF FUNDAMENTAL SOLUTIONS FOR THE SOLUTION OF STEADY-STATE FREE BOUNDARY PROBLEMS. Andreas Karageorghis, *Mathematics Department, Southern Methodist University, Dallas, Texas 75275, U.S.A.*

The method of fundamental solutions is formulated for the solution of steady-state free boundary problems. The method is tested on three such problems and the results compared to published results obtained with other numerical methods.

A MULTIGRID CONJUGATE RESIDUAL METHOD FOR THE NUMERICAL SOLUTION OF THE HARTREE–FOCK EQUATION FOR DIATOMIC MOLECULES. Kjell Davstad, *Institute of Theoretical Physics, University of Stockholm, Vanadisvagen 9, S-113 46 Stockholm, SWEDEN.*

Discretization of the Hartree–Fock equations in operational form leads to unsymmetric positive definite and indefinite linear equations. To solve these equations a combination of the multigrid method and the Orthomin method with Gauss–Seidel relaxation as preconditioner is used. The differential equations are approximated to the sixth order and the solution is extrapolated to the eighth order. The method is fully parallelized. The largest molecule treated is CuH.

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