Tokamak edge plasma fluid equations. In this set of fluid equations, the transport coefficients are highly nonlinear functions of the dependent variables; mass and energy transfer due to atomic reactions is included. The techniques of adaptive damped iteration, mesh sequencing, and reduced factorization are combined to increase the radius of convergence and to accelerate convergence. These techniques are illustrated through a model problem.

Uniform High Order Spectral Methods for One- and Two-Dimensional Euler Equations. Wei Cai. *University of North Carolina at Charlotte, Charlotte, North Carolina, USA*; Chi-Wang Shu. *Brown University, Providence, Rhode Island, USA.*

In this paper we study uniform high order spectral methods to solve multi-dimensional Euler gas dynamics equations. Uniform high order spectral approximations with spectral accuracy in smooth regions of solutions are constructed by introducing the idea of the essentially non-oscillatory polynomial (ENO) interpolations into the spectral methods. Based on the new approximations, we propose nonoscillatory spectral methods which possess the properties of both upwinding difference schemes and spectral methods. We present numerical results for inviscid Burgers' equation, various one-dimensional Euler equations including the interactions between a shock wave and density disturbances, Sod's and Lax's, and blast wave problems. Finally, we simulate the interaction between a Mach-3 two-dimensional shock wave and a rotating vortex.

Explicit Streamline Method for Steady Flows of Non-Newtonian Matter: History-Dependence and Free Surfaces. S. G. Chung. *Western Michigan University, Kalamazoo, Michigan, USA*; K. Kuwahara. *The Institute of Space and Astronautical Science, 3-1-1 Yoshinodai, Sagamihara, Kanagawa 229, Japan.*

A new finite-difference method involving a streamline coordinate is developed for analyzing two-dimensional steady non-Newtonian flows with history dependence. The boundary of the material is partially free and partially confined. The proposed method is neither the method of stream function nor the use of convected reference frame. It simply regards streamline as an independent coordinate, thereby retaining the merits of both the Eulerian and Lagrangian schemes. The efficiency of the method is demonstrated in several examples of model matter steadily discharging from a slit into a free space.

On the Numerical Accuracy of the Fokker–Planck Approximation to the Hierarchy of Master Equations. C. A. Stone, M. Vicanek, and N. M. Ghoniem. *University of California, Los Angeles, California, USA.*

Many physical processes are described by birth and death phenomena and can generally be treated with either a master equation or Fokker–Planck formulation. We present a numerical study for one such process which describes the agglomeration of atomic clusters on clean surfaces during the early stages of thin film formation. We develop moment equations which describe the evolving size distribution of these clusters during an atom deposition process. These moments are derived from both the hierarchical master equations and the equivalent Fokker–Planck approximation. We limit our treatment to growth and decay mechanisms which occur via single-atom transitions. It is shown that the Fokker–Planck approximation is surprisingly good for sizes down to a few atoms. Analysis of the numerical accuracy of the Fokker–Planck approximation is given by comparing results for the total density of clusters, their average size, and the first four moments of the size distribution function. Results are presented for growth laws associated with two- and three-dimensional cluster shapes.