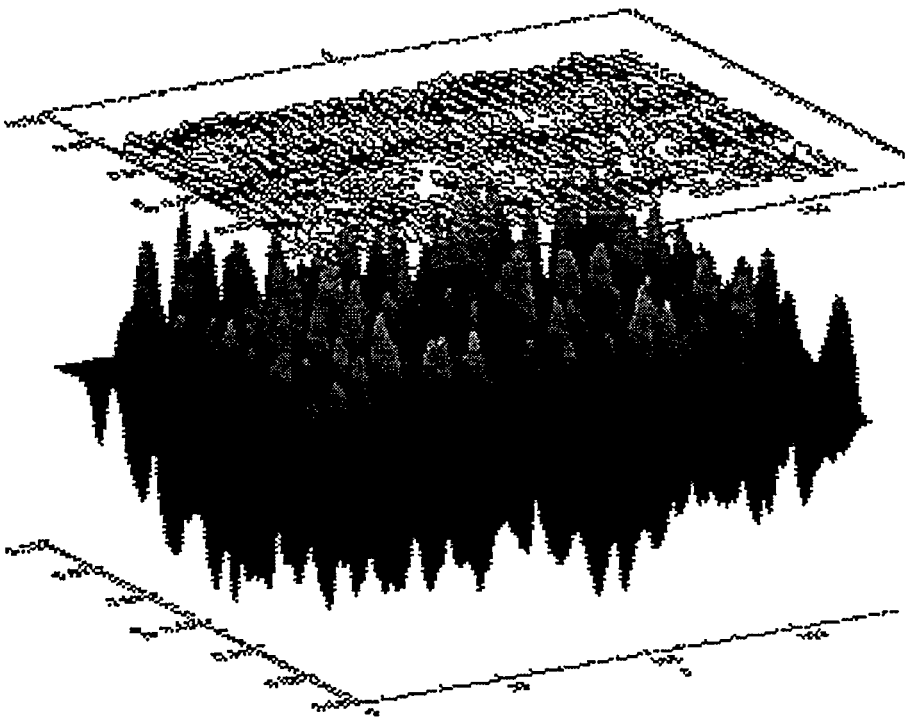
CONF-9407126--3

Energy Research Power Users Symposium II – July 12, 1994



Parallel Plasma Fluid Turbulence Calculations

J. N. Leboeuf, B. A. Carreras, L. A. Charlton, J. B. Drake,
V. E. Lynch, D. E. Newman, K. L. Sidikman, and D. A. Spong
Oak Ridge National Laboratory
Oak Ridge, TN 37831-8071

The study of plasma turbulence and transport is a complex problem of critical importance for fusion-relevant plasmas. To this day, the fluid treatment of plasma dynamics is the best approach to realistic physics at the high resolution required for certain experimentally relevant calculations. Core and edge turbulence in a magnetic fusion device have been modeled using state-of-the-art, nonlinear, three-dimensional, initial-value fluid and gyrofluid codes. Parallel implementation of these models on diverse platforms — vector parallel (National Energy Research Supercomputer Center's CRAY Y-MP C90), massively parallel (Intel Paragon XP/S 35), and serial parallel (clusters of high-performance workstations using the Parallel Virtual Machine protocol) — offers a variety of paths to high resolution and significant improvements in real-time efficiency, each with its own advantages. The largest and most efficient calculations have been performed at the 200 Mword memory limit on the C90 in dedicated mode, where an overlap of 12 to 13 out of a maximum of 16 processors has been achieved with a gyrofluid model of core fluctuations. The richness of the physics captured by these calculations is commensurate with the increased resolution and efficiency and is limited only by the ingenuity brought to the analysis of the massive amounts of data generated.