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Parallel Implementation of the Multi-Dimensional Spectral Code SPECT3D on large 3D grids. IGOR E. GOLOVKIN, JOSEPH J. MACFARLANE, PAMELA R. WOODRUFF, NICOLAS A. PEREYRA, Prism Computational Sciences, Inc. — The multi-dimensional collisional-radiative, spectral analysis code SPECT3D can be used to study radiation from complex plasmas. SPECT3D can generate instantaneous and time-gated images and spectra, space-resolved and streaked spectra, which makes it a valuable tool for post-processing hydrodynamics calculations and direct comparison between simulations and experimental data. On large three dimensional grids, transporting radiation along lines of sight (LOS) requires substantial memory and CPU resources. Currently, the parallel option in SPECT3D is based on parallelization over photon frequencies and allows for a nearly linear speed-up for a variety of problems. In addition, we are introducing a new parallel mechanism that will greatly reduce memory requirements. In the new implementation, spatial domain decomposition will be utilized allowing transport along a LOS to be performed only on the mesh cells the LOS crosses. The ability to operate on a fraction of the grid is crucial for post-processing the results of large-scale three-dimensional hydrodynamics simulations. We will present a parallel implementation of the code and provide a scalability study performed on a Linux cluster.

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