Public Abstract
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The post-accident nuclear reactor primary and containment environments can be characterized by high temperatures and pressures, and fission products and nuclear aerosols which can be hazardous when released into the environment. These nuclear aerosols evolve via natural transport processes and several other factors which make the computation of aerosol dynamics very complicated. In this research, several aerosol processes such as coagulation, deposition, condensation, and source reinforcement are explored for a multi-component, aerosol dynamics problem in a spatially homogeneous medium. Several sampling algorithms – direct, the Metropolis, the No Time Counter (NTC) and modified direct sampling algorithms have been explored to increase the speed of the computations. Results showed that the Metropolis sampling algorithm was very effective and fast. Several test problems were simulated and the results were verified against the analytical and sectional results. It was concluded that the assumption of a single mean density is not appropriate due to the complicated effect of component densities on the aerosol processes. The methods developed and the insights gained will also be helpful in future research on the challenges associated with the description of fission product and aerosol releases.