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The Spatial Chemical Langevin and Reaction Diffusion Master Equations: Moments and Qualitative Solutions ATIYO GHOSH, ANDRE LEIER, TATIANA MARQUEZ-LAGO, Okinawa Institute of Science and Technology — Spatial stochastic effects are prevalent in many biological systems spanning a variety of scales, from intracellular (e.g. gene expression) to ecological (plankton aggregation). The most common ways of simulating such systems involve drawing sample paths from either the Reaction Diffusion Master Equation (RDME) or the Smoluchowski Equation, using methods such as Gillespie's Simulation Algorithm, Green's Function Reaction Dynamics and Single Particle Tracking. The simulation times of such techniques scale with the number of simulated particles, leading to much computational expense when considering large systems. The Spatial Chemical Langevin Equation (SCLE) can be simulated with fixed time intervals, independent of the number of particles, and can thus provide significant computational savings. However, very little work has been done to investigate the behavior of the SCLE. In this talk we summarize our findings on comparing the SCLE to the well-studied RDME. We use both analytical and numerical procedures to show when one should expect the moments of the SCLE to be close to the RDME, and also when they should differ.

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