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Quantifying the Effects of Noise on Diffuse Interface Models: Cahn-Hilliard-Cook equations SPENCER PFEIFER, BASKAR GANAPATHYSUBRAMANIAN, Iowa State Univ — We present an investigation into the dynamics of phase separation through numerical simulations of the Cahn-Hilliard-Cook (CHC) equation. This model is an extension of the well-known Cahn- Hilliard equation, perturbed by an additive white noise. Studies have shown that random fluctuations are critical for proper resolution of physical phenomena. This is especially true for phase critical systems. We explore the transient behavior of the solution space for varying levels of noise. This is enabled by our massively scalable finite element-based numerical framework. We briefly examine the interplay between noise level and discretization (spatial and temporal) in obtaining statistically consistent solutions. We show that the added noise accelerates progress towards phase separation, but retards dynamics throughout subsequent coarsening. We identify a scaling exponent relating morphology metrics with the level of noise. We observe a very clear scaling effect of finite domain size, which is observed to be offset by increasing levels of noise. Domain scaling reveals a clear microstructural asymmetry at various stages of the evolution for lower noise levels. In contrast, higher noise levels tend to produce more uniform morphologies.

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