

# Tricritical slowing down in hybrid update schemes

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The divergence of correlation times with the system size at continuous phase transitions (or critical slowing down) poses a severe obstacle for Monte Carlo simulations. This growth of characteristic times is described by a power-law in the system size with a dynamic critical exponent  $z$ . A standard treatment is the use of multi-spin update schemes, most notably cluster algorithms such as Wolff and Swendsen-Wang. By constructing spin clusters via the Fortuin-Kasteleyn representation, these algorithms mimic the physical properties of the system while also suppressing critical slowing down, dramatically reducing  $z$  for Ising and Potts universality classes. Yet, many models possess rich phase diagrams that host both first- and second-order transitions, such as the Blume-Capel model. Since clusters are unable to expand on zero spins, hybrid schemes are often utilised, including both cluster and single-spin flips. By providing a systematic finite-size scaling analysis of the integrated autocorrelation time, we ask how the dynamic critical exponent  $z$  of hybrid update schemes behaves as the density of zeros increases. We find that a (tri)critical slowdown emerges only at the tricritical point, due to the correlated percolation of the vacancies.