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Slow Droplet-Driven Relaxation of Stochastic Ising Models in the Vicinity of the Phase Coexistence Region

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Abstract: We consider the stochastic Ising models (Glauber dynamics) corresponding to the infinite volume basic Ising model in arbitrary dimension $d \geqq 2$ with nearest neighbor interaction and under a positive external magnetic field h. Under minimal assumptions on the rates of flip (so that all the common choices are included), we obtain results which state that when the system is at low temperature T, the relaxation time when the evolution is started with all the spins down blows up, when $h \searrow 0$, as $\exp(\lambda(T)/h^{d-1})$ (the precise results are lower and upper bounds of this form). Moreover, after a time which does not scale with h and before a time which also grows as an exponential of a multiple of $1/h^{d-1}$ as $h \searrow 0$, the law of the state of the process stays, when h is small, close to the minus-phase of the same Ising model without an external field. These results may be considered as a partial vindication of a conjecture raised by Aizenman and Lebowitz in connection to the metastable behavior of these stochastic Ising models.

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