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Spinodal slowing down and scaling in a holographic model

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The dynamics of first-order phase transitions in strongly coupled systems are relevant in a variety of systems, from heavy ion collisions to the early universe. Holographic theories can be used to model these systems, with fluctuations usually suppressed. In this case the system can come close to a spinodal point where theory and experiments indicate that the the behaviour should be similar to a critical point of a second-order phase transition. We study this question using a simple holographic model and confirm that there is critical slowing down and scaling behaviour close to the spinodal point, with precise quantitative estimates. In addition, we determine the start of the scaling regime for the breakdown of quasistatic evolution when the temperature of a thermal bath is slowly decreased across the transition. We also extend the analysis to the dynamics of second-order phase transitions and strong crossovers.

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