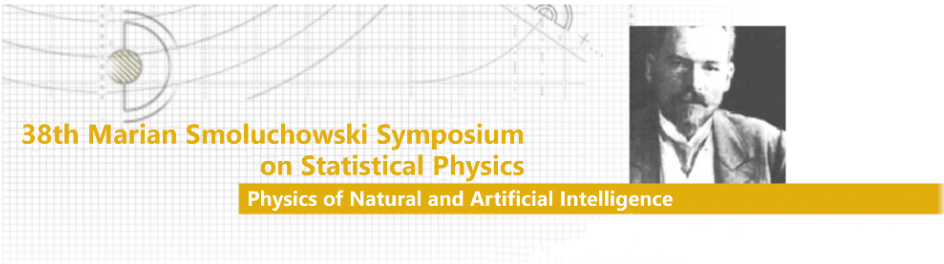

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Spatiotemporal signatures of phase transitions in vertex models

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Vertex models provide a powerful framework for studying the mechanics and dynamics of confluent biological tissues that undergo fluid to solid-like transitions during morphogenesis. Although these transitions are often characterized by changes in macroscopic properties, the underlying microscopic dynamics, particularly their spatiotemporal fluctuations, remain weekly understood. Here, we investigate fluid-to-solid transitions in a two-dimensional vertex model by performing extensive numerical simulations. We focus on the analysis of dynamics and heterogeneities emerging in both space and time. We quantify spatiotemporal fluctuations via the four-point dynamical susceptibility and cell displacement maps. In addition, we conduct an analysis of topological defects and the nematic order parameter to characterize the structural changes during the transition. These distinct spatiotemporal signatures can be further used to compare with cellular patterns observed in biological tissues. Overall, the proposed metrics to quantify dynamics of spatial heterogeneities in confluent tissues can be applied in other disordered systems to study glass and jamming transitions.

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