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Pattern formation from Gauge/Gravity duality

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In the framework of the AdS/CFT correspondence, we find a neutral complex scalar field dynamics in a 2+1 dimensional black hole background which can provide a scheme for studying the pattern formation process in 1+1 dimensional reaction-diffusion systems. The patterns include plane wave, defect turbulence, phase turbulence, spatio-temporal intermittency where defect chaos coexists with stable plane wave, and coherent structures. A phase diagram is obtained by studying the linear instability of the plane wave solutions to determine the onset of the holographic version of the BFN instability. Near the critical temperature the holographic model is dual to the one-dimensional complex Ginzburg-Landau equation (CGLE), which has been studied extensively in reaction-diffusion systems. While at low temperature the holographic theory is different from CGLE.

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