

DYNAMIC TRANSITIONS AND TURING PATTERNS OF THE BRUSSELATOR MODEL

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Abstract

The dynamic transitions of the Brusselator model has been recently analyzed in Y. Choi et'al (2021) and T. Ma, S. Wang (2011). Our aim in this paper is to address the relation between the pattern formation and dynamic transition results left open in those papers. We consider the problem in the setting of a 2D rectangular box where an instability of the homogeneous steady state occurs due to the perturbations in the direction of several modes becoming critical simultaneously. Our main results are two folds: (1) a rigorous characterization of the types and structure of the dynamic transitions of the model from basic homogeneous states and (2) the relation between the dynamic transitions and the pattern formations. We observe that the Brusselator model exhibits different transition types and patterns depending on the nonlinear interactions of the pattern of the critical modes.

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