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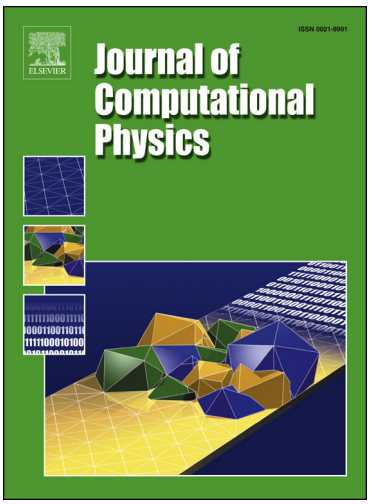

Continuation of probability density functions using a generalized Lyapunov approach

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Continuation of Probability Density Functions using a Generalized Lyapunov Approach

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Abstract

Techniques from numerical bifurcation theory are very useful to study transitions between steady fluid flow patterns and the instabilities involved. Here, we provide computational methodology to use parameter continuation in determining probability density functions of systems of stochastic partial differential equations near fixed points, under a small noise approximation. Key innovation is the efficient solution of a generalized Lyapunov equation using an iterative method involving low-rank approximations. We apply and illustrate the capabilities of the method using a problem in physical oceanography, i.e. the occurrence of multiple steady states of the Atlantic Ocean circulation.

Keywords: continuation of fixed points, stochastic dynamical systems, Lyapunov equation, probability density function

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