Physics > Biological Physics

Mobility induces global synchronization of oscillators in periodic extended systems

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We study synchronization of locally coupled noisy phase oscillators which move diffusively in a one-dimensional ring. Together with the disordered and the globally synchronized states, the system also exhibits several wave-like states which display local order. We use a statistical description valid for a large number of oscillators to show that for any finite system there is a critical spatial diffusion above which all wave-like solutions become unstable. Through Langevin simulations, we show that the transition to global synchronization is mediated by the relative size of attractor basins associated to wave-like states. Spatial diffusion disrupts these states and paves the way for the system to attain global synchronization.

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