Chimeras in networks with purely local coupling

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Chimera states in spatially extended networks of oscillators have some oscillators synchronised while the remainder are asynchronous. These states have primarily been studied in networks with nonlocal coupling, and more recently in networks with global coupling. Here we present three networks with only local coupling (diffusive, to nearest neighbours) which are numerically found to support chimera states. One of the networks is analysed using a self-consistency argument in the continuum limit, and this is used to find the boundaries of existence of a chimera state in parameter space.

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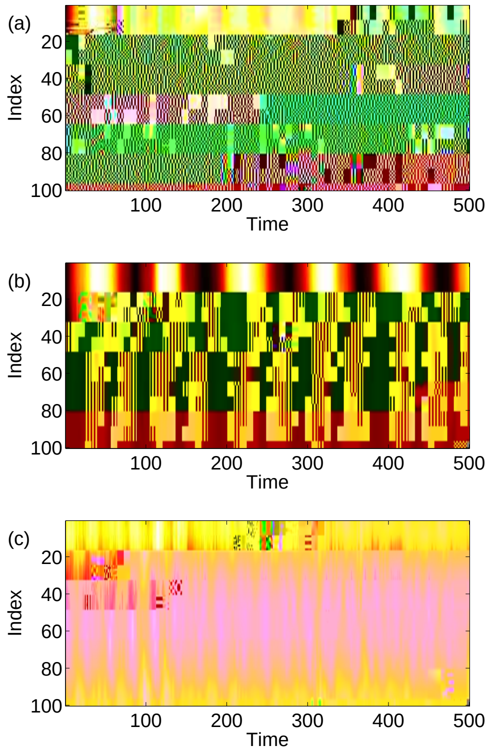
Chimera states, in which a symmetric network of identical oscillators splits into two regions, one of coherent oscillators and one of incoherent, have been studied intensively over the past decade [1–3]. Spatial networks on which they have been studied include a one-dimensional ring [2, 4–8], a square domain without periodic boundary conditions [9–11], a torus [12, 13] and a sphere [14].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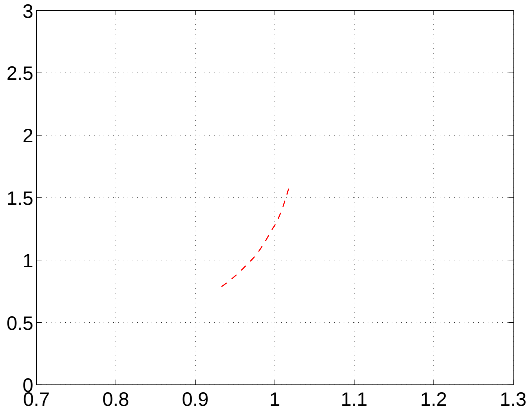

3
2.5
2
1.5
1
0.5
0
0.7
0.8
0.9
1
1.1
1.2
1.3

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