Chimeras in globally interacting populations of chaotic oscillators

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We consider a system consisting of two populations of identical chaotic oscillators, each having internal interactions, and globally coupled through their respective mean fields. We investigate the collective behavior of the system on its space of parameters, given by the strength of the global coupling (inter-population) and the strength of the internal coupling (intra-population). We find these collective states in different regions of parameters: (i) chaotic chimera states, where one population reaches a chaotic synchronized regime, while the other remains incoherent; (ii) complete synchonization, where both populations are synchronized internally and to each other; (iii) generalized synchronization, where each population is synchronized, but not to each other.; and (iv) incoherence, where both populations are desynchronized. These states are robust for different partition sizes and for different network topologies of the populations. We characterize the probability for the emergence of chimera states as a function of parameters. In addition, we find that chimera states arise even when the oscillators possess chaotic hyperbolic attractors, a relevant result since it has been recently shown that hyperbolicity prevents the occurrence of chimeras in the presence of nonlocal couplings.