Title:	Environment-induced symmetry breaking of the oscillation-death state
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Abstract:	We investigate the impact of a common external system, which we call a common environment, on the oscillator death (OD) states of a group of Stuart-Landau oscillators. The group of oscillators yield a completely symmetric OD state when uncoupled to the external system, i.e., the two OD states occur with equal probability. However, remarkably, when coupled to a common external system this symmetry is significantly broken. For exponentially decaying external systems, the symmetry breaking is very pronounced for low environmental damping and strong oscillator-environment coupling. This is evident through the sharp transition from the symmetric to asymmetric state occurring at a critical oscillator-environment coupling strength and environmental damping rate. Further, we consider time-varying connections to the common external environment, with a fraction of oscillator-environment links switching on and off. Interestingly, we find that the asymmetry induced by environmental coupling decreases as a power law with increase in fraction of such on-off connections. This suggests that blinking oscillator-environment links can restore the symmetry of the OD state. Last, we demonstrate the generality of our results for a constant external drive and find marked breaking of symmetry in the OD states there as well. When the constant environmental drive is large, the asymmetry in the OD states is very large, and the transition between the symmetric and asymmetric state with increasing oscillator-environment coupling is very sharp. So our results demonstrate an environmental coupling-induced mechanism for the prevalence of certain OD states in a system of oscillators and suggests an underlying process for obtaining certain states preferentially in ensembles of oscillators with environment-mediated coupling.
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