

Deterministic coherence resonance in coupled chaotic oscillators with frequency mismatch

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Abstract.

A small mismatch between natural frequencies of unidirectionally coupled chaotic oscillators can induce coherence resonance in the slave oscillator for a certain coupling strength. This surprising phenomenon resembles “stabilization of chaos by chaos,” i.e., the chaotic driving applied to the chaotic system makes its dynamics more regular when the natural frequency of the slave oscillator is a little different than the natural frequency of the master oscillator. The coherence is characterized with the dominant component in the power spectrum of the slave oscillator, normalized standard deviations of both the peak amplitude and the interpeak interval, and Lyapunov exponents. The enhanced coherence is associated with increasing negative both the third and the fourth Lyapunov exponents, while the first and second exponents are always positive and zero, respectively.