Network-induced multistability through lossy coupling

Jürgen Kurths[*1,2]

[1]Potsdam Institute for Climate Impact Research – Potsdam 14412, Germany
[2]Department of Physics – Humboldt University at Berlin, Berlin 12489, Germany

Abstract

The stability of synchronized networked systems is a multi-faceted challenge for many natural and technological fields, from cardiac and neuronal tissue pacemakers to power grids. For these, the ongoing transition to distributed renewable energy sources leads to a proliferation of dynamical actors. The desynchronization of a few or even one of those would likely result in a substantial blackout. Thus, the dynamical stability of the synchronous state has become a leading topic in power grid research. Here we uncover that, when taking into account physical losses in the network, the back-reaction of the network induces new exotic solitary states in the individual actors and the stability characteristics of the synchronous state are dramatically altered. These effects will have to be explicitly taken into account in the design of future power grids. We expect the results presented here to transfer to other systems of coupled heterogeneous Newtonian oscillators.

[*]Speaker