

Examining the dynamics of complex networks

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A special issue of *EPJST*, edited by Dr. Jurgen Kurths, Senior Advisor at the Research Department for Complexity Science, Potsdam Institute for Climate Impact Research (PIK), and Professor and Senior Advisor at Humboldt University, Berlin, Ahmedabad, brings together a collection of papers focusing improving our understanding of the collective dynamics of complex systems. The special issue pays particular attention to the applications of this understanding in the diverse fields of neuroscience, climate modeling, and Earth science.

"During the last decade, networks with complex topology have become a very powerful approach for understanding large complex systems in various fields of applications ranging from neuroscience, via engineering to sociology, economy, and Earth sciences," Kurths says in an introduction of the special issue. "Complex real-world systems are modeled as networks of interacting nodes, combining different application fields with approaches from dynamical system theory, statistical physics, time series analysis, and

graph theory."

Complex real-world systems such as those considered by the authors of the 33 studies that comprise the special issue are made up of networks of interacting nodes. The editor goes on to explain that the papers in the special issue considered systems that can feature anywhere from hundreds to billions of such nodes. The systems can also be arranged in sparse conglomerations or more organized hierarchical structures.

The papers in the special issue fall into three main fields; theory and method — covering a broad range of topics like dynamics of excitable systems, cluster dynamics, and the interplay of noise and feedback — the applications to neuroscience, and Earth science applications.

The special issue came about as a result of research conducted in the framework of the German-Brazilian International Research Training Group (IRTG) funded by the German Science Foundation DFG and the Sao Paulo Research Foundation FAPESP.

This collaboration which launched in 2011 includes researchers from an eclectic range of fields from physics, mathematics, biology, to climatology and metrology. These professionals are drawn from institutes including, but not limited to the University of Sao Paulo, National Institute for Space Research, Humboldt University at Berlin, Potsdam Institute for Climate Impact Research.

"We hope that this volume will contribute to discussions on advances in the [field](#) of dynamical networks and stimulate further studies," concludes Kurths.

More information: Serhiy Yanchuk et al, Dynamical phenomena in complex networks: fundamentals and applications, *The European*

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