

Propagation of Extreme Events in Spatially Extended Excitable Systems (extension)

Initiative: Modellierung und Simulation komplexer Systeme (beendet)

Ausschreibung: Extremereignisse: Modellierung, Analyse und Vorhersage

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Laufzeit: 3 Jahre

This project extension aims at a theoretical understanding of the propagation of initially localized extreme events in spatially extended excitable systems. Two particular extreme events are considered: harmful algal blooms in the ocean and epileptic seizures in the human brain. Having already identified and experimentally verified important mechanisms for the generation of extreme events, the team will now evaluate mechanisms relevant for their propagation. They plan to substantially extend the previously developed models in order to account for competing activating and inhibiting processes, which turned out to be essential for propagation. Extreme events possess different forms of propagation due to the different transport-mediating conditions. These differences will be bridged by developing a unifying modeling framework of the propagation. A robust identification and quantification of complex directed propagation phenomena in such systems from sparsely sampled data as well as a prediction of when and where extreme events propagate are challenging problems requiring the development of new time-series-analysis techniques. Data sets from algal blooms and epileptic seizures are used to verify the propagation of extreme states.

Projektbeteiligte

Prof. Dr. Ulrike Feudel

Universität Oldenburg
Fakultät V - Mathematik und Naturwissenschaften
Institut für Chemie und
Biologie des Meeres (ICBM)
Oldenburg

Prof. Dr. Holger Kantz

Max-Planck-Institut für Physik
komplexer Systeme
AG Nichtlineare Dynamik
und Zeitreihenanalyse
Dresden

Prof. Dr. Jürgen Kurths

Potsdam-Institut für
Klimafolgenforschung e. V.
Forschungsbereich 4:
Transdisziplinäre Konzepte und Methoden
Potsdam

Prof. Dr. Klaus Lehnertz

Universitätsklinikum Bonn
Klinik für Epileptologie
AG Neurophysik
Bonn

Dr. Stefanie Moorthi

Universität Oldenburg
Fakultät 5: Mathematik und Naturwissenschaften
Institut für Chemie und Biologie des Meeres
Planktologie
Wilhelmshaven

Prof. Dr. Helmut Hillebrand

Universität Oldenburg
Institut für Chemie und Biologie des Meeres
Arbeitsgruppe Planktologie
Wilhelmshaven