Registration

We encourage students from all fields and institutions. Selection of participants will be based on their motivation letter. While PhD students are the main target audience, applications from Master's students and postdocs are also welcomed.

Participation in the summer school is free of charge. Please visit our website for up-to-date information on logistics and accommodation.
www.mscj.uni-jena.de/autumn-school-2016/

Please send your application documents (CV and one-page motivation letter) to Alexander Freytag, **alexander.freytag@uni-jena.de**.
Application deadline: 15 August 2016
Notification of acceptance: 31 August 2016

Students from the supporting graduate networks or graduate schools: please indicate your affiliation as we have a fraction of slots reserved for you.

Venue

The summer school will be hosted by the Max Planck Institute for Biogeochemistry, located at Hans-Knöll-Str. 10 in Jena, Germany.
For detailed directions please visit
https://www.bgc-jena.mpg.de/index.php/Institute/Directions

MichaelStifelCenterJena
for Data-Driven and Simulation Science

Michael Stifel Center Jena
for Data-Driven and Simulation Science
Friedrich Schiller University Jena
and Max Planck Institute for Biogeochemistry

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FRIEDRICH SCHILLER UNIVERSITY JENA
AND
MAX PLANCK INSTITUTE FOR BIOGEOCHEMISTRY

MSCJ Autumn School
Dynamics of Natural (Eco-) Systems: Theory and Applications

26 — 30 September 2016 | MPI-BGC, Jena

Friedrich-Schiller-Universität Jena

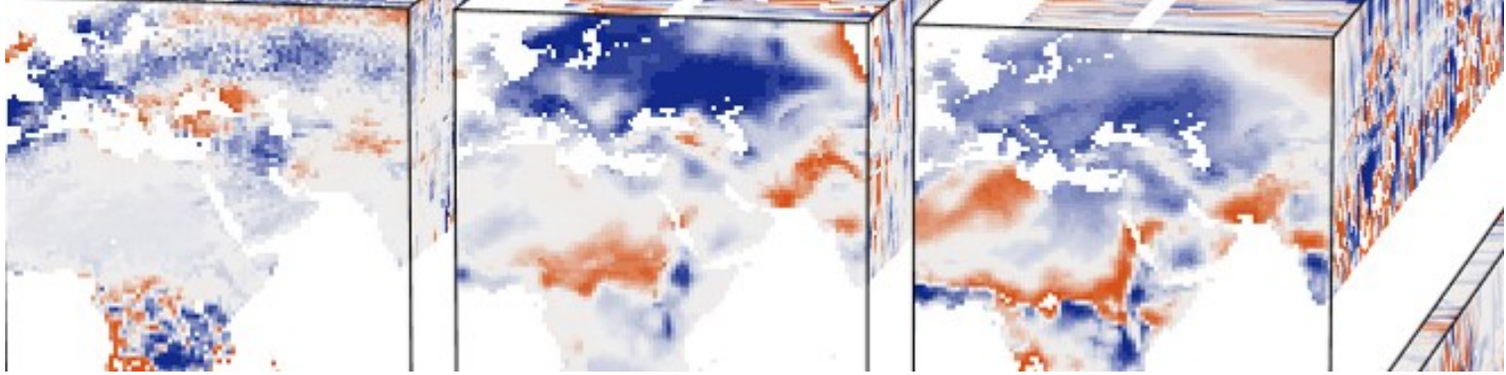
Overview

Understanding the dynamics of natural systems is a complicated endeavor that requires dealing with responses to a changing environment, unobservable system states, or abrupt transitions. Many natural systems additionally experience modifications of their intrinsic dynamics over their lifetime e.g. through long-range evolution or short-term adaptation. This holds true at various levels of organization from single organs to organisms, organismic interactions, ecosystem dynamics, and the entire coupled biosphere-climate system.

Typically, these phenomena are investigated either from a theoretical point of view or by following an empirical path via observations. Today model-data integration opportunities allow integrating theory and observations to gain deeper insights into the behavior of natural systems.

This autumn school aims at bringing together PhD students and experts in multiple related fields ranging from autonomous and non-autonomous dynamical systems to the empirical analysis of nonlinear processes and model-data integration, bridging the gap between theory and application. This one-week autumn school aims at providing an overview of relevant developments in this very broad field to stimulate interdisciplinary dialogue and advance in the respective PhD (or MSc / PostDoc) projects. Hands-on tutorials will demonstrate how novel methods can be implemented and will give ample space to discuss applications to novel problems. We anticipate this autumn-school to significantly broaden the horizon of all participants and to become a catalyzer for a variety of interdisciplinary activities at the intersection of theory and empirical

All participants will get access to source code and data sets used in class in order to ensure reproducibility and knowledge transfer. Lecture slides will furthermore be made available.
Future MSCJ autumn schools are planned in order to educate Master's and PhD students with respect to the upcoming challenges of data-intensive research.



Program

Statistical Concepts

Day 1 Time series analysis (*H. Kantz, MPI Physics of Complex Systems*)
Novel approaches for exploring highly resolved connectivity *(Britta Pester, University of Jena)*

Day 2 Matching phenomenological models with the complex reality: the climate case *(M. Crucifix, Univ. Catholique de Louvain)*
Environmental data integration *(M. Reichenstein, MPI Biogeochemistry, Jena)*

SOCIAL EVENT

Participants will learn how to model and discover patterns in real-world data obtained from ecological and biological systems, how to assess the system's stability, and how to reason about unusual events. The course will have a focus on data science and model-data integration to reflect the growing need for well-educated interdisciplinary researchers at the intersection between computer science, mathematics, and natural sciences. With respect to research topics, the main focus will be on patterns in dynamical systems.

Dynamical Systems

Day 3 Autonomous dynamical systems: introduction *(T. Oertel-Jaeger, University of Jena)*
Non-autonomous dynamical systems *(M. Rasmussen, Imperial College London)*
Dynamics and short term predictions *(H. Kantz, MPI Physics of Complex Systems)*
Modelling Uncertainty *(TBA)*

STUDENT POSTER SESSION

Day 4 Quasi-potentials: A framework for analyzing stochastic dynamical systems in ecology (*B. Nolting and C. Stieha, Case Western Reserve University, Cleveland*)
Ecosystems as non-autonomous dynamical systems *(Carlos Sierra, MPI-BGC)*

Applications and Real-World Examples

Day 5 Reverse Engineering (*P. Dittrich, Uni. Jena*)
System characterization (*TBA*)
The Earth System Data Cube *(M. Mahecha, MPI-BGC Jena)*
Applications to Earth Surface Processes *(A. Brenning, University of Jena)*