



复旦大学数学科学学院 数学综合报告会

报告题目: **Our Earth's Climate: A Highly Complex and Dynamic System**

报告人: Juergen Kurths

(Potsdam Institute for Climate Impact Research & Humboldt University, Berlin, Germany)

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摘要: First basic dynamic features of the Earth's climate are presented. This refers to the past, present and possible future of this system. Although we have been in a rather quiet climate regime during the last 10,000 years, there are serious dangers mainly due to anthropogenic influences. Here possible sea-level rise is discussed. Second, we analyse climate dynamics from a complex network approach. This leads to an inverse problem: Is there a backbone-like structure underlying the climate system? For this we propose a method to reconstruct and analyze a complex network from data generated by a spatio-temporal dynamical system. This approach enables us to uncover relations to global circulation patterns in oceans and atmosphere. This concept is then applied to extreme events in rainfall data; in particular, we develop a general framework to study extreme events by combining a non-linear synchronization technique with complex networks. Applying this method, we uncover a new mechanism of extreme floods in the eastern Central Andes. Moreover, we analyze the Indian Summer Monsoon (ISM) and identify two regions of high importance. Estimating an underlying critical point leads to a substantially improved prediction of the onset of the ISM.

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