Extraordinary Statistical Physics Seminar

June 12th, 2017.
Monday, 11.00

ELTE TTK Northern Building 0.87

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The Physics of Climate Sensitivity: A Tale of Deterministic and Stochastic Dynamical Systems

The climate system is a nonlinear, heterogeneous and complex physical system that exhibits variability on many scales of time and space. Its dynamical behavior results from a plethora of physical, chemical and biological processes. Hence, it is typically studied across a hierarchy of models, from low- dimensional systems of ordinary differential equations to infinite- dimensional systems of partial and functional differential equations. The theory of differentiable dynamical systems (DDS) has provided a road map for climbing this hierarchy and for comparing theoretical results with observations.

The climate system is also subject to time-dependent forcing, both natural and anthropogenic, e.g. solar luminosity variations, volcanic eruptions and changing greenhouse gas concentrations. Hence increased attention has been paid recently to applications of the theory of non-autonomous and random dynamical systems in order to describe the way that this complex system changes on time scales comparable to a human lifetime and longer. This talk will review the road from the classical applications of DDS theory to low-dimensional climate models with no explicit time dependence to current efforts at applying non-autonomous and random dynamical systems theory to high-end climate models governed by partial and functional differential equations, deterministic as well as stochastic.

M. Ghil, 2017: The wind-driven ocean circulation: Applying dynamical systems theory to a climate problem, Discr. Cont. Dyn. Syst. A, 37(1), 189-228.