DY 51: Extreme Events

Time: Thursday 16:15–17:00 Location: HÜL 186

DY 51.1 Thu 16:15 HÜL 186

Time to build Noah's ark? Searching for trends in extreme events of river data. — Philipp Müller and •Holger Kantz — MPI for the Physics of Complex Systems, Dresden

Floods are one of the most devastating natural disasters striking Germany and at least at a perceived level one might find them happening more frequently nowadays. In this talk we search for trends in extreme events using the example of the river Elbe in Dresden. We will apply the extreme value theory in a non-stationary setting and discuss difficulties, potentials and limitations of this approach.

DY 51.2 Thu 16:30 HÜL 186

Caustics in nonlinear waves — •Gerrit Green[1,2] and Ragnar Fleischmann[1] — [1]Max-Planck Institute for Dynamics and Self-Organization, Am Fassberg 17, 37077 Göttingen, Germany — [2]Institute for Nonlinear Dynamics, Departement of Physics, Georg-August University Göttingen, 37077 Göttingen, Germany

Rogue waves appear suddenly and unpredictably on the ocean surface in otherwise benign conditions and have a large amplitude. Potential formation mechanisms are random focusing as well as modulational instability in nonlinear wave equations. The former leads to branched flow, a universal phenomenon occurring in wave or particle flows that propagate through weakly scattering media, closely connected to the occurrence of random caustics. We investigate caustics in the nonlinear Schrödinger equation which is used as a model for deep water surface waves, as well as Bose-Einstein condensates and for light propagating through a nonlinear medium. We study the impact of small nonlinearities on branched flows and the distance to the onset of random caustics.

DY 51.3 Thu 16:45 HÜL 186

An early warning signal for interior crises in excitable systems — •Stephan Bialonski[1], Rajat Karnatak[2], and Holger Kantz[1] — [1]Max-Planck-Institute for the Physics of Complex Systems, Dresden, Germany — [2]Leibniz-Institute of Freshwater Ecology and Inland Fisheries, Berlin, Germany

The ability to reliably predict critical transitions in dynamical systems is a long-standing goal of diverse scientific communities. Previous work focused on early warning signals related to local bifurcations (critical slowing down) and non-bifurcation type transitions. We extend this toolbox and report on a characteristic scaling behavior (critical attractor growth) that is indicative of an impending global bifurcation, an interior crisis in excitable systems. We demonstrate our early warning signal in a model of coupled neurons known to exhibit extreme events.