ALPEN-ADRIA UNIVERSITÄT KLAGENFURT

Invitation to a Guest Lecture

Iacopo Longo

Technische Universität München

"Rate-induced tipping as a nonautonomous saddle-node bifurcation in a class of scalar quadratic ODEs"

Z.0.01 | Monday, 20 June 2022 | 3:00 p.m.

Abstract

We carry out an in-depth analysis of the possible dynamical scenarios for scalar differential equations of the type $x' = -x^2 + q(t)x + p(t)$, where $q : \mathbb{R} \to \mathbb{R}$ and $p : \mathbb{R} \to \mathbb{R}$ are bounded and uniformly continuous. Particularly, the study of nonautonomous bifurcations of saddle-node type is fundamental to explain the absence or occurrence of rate-induced tipping for the differential equation $y' = (y - 2/\pi \arctan(ct))^2 + p(t)$ as the rate c varies in $[0, \infty)$. A classical attractor-repeller pair, whose existence for $c = 0$ is assumed, may persist for any $c > 0$, or disappear at a certain critical rate $c = c_0$, giving rise to rate-induced tipping. A suitable example demonstrates that it is possible to have an alternation between intervals of values of c in $[0, \infty)$ where the attractor-repeller pair exists and intervals where it does not. We also treat the case where $q : \mathbb{R} \to \mathbb{R}$ and $p : \mathbb{R} \to \mathbb{R}$ are piece-wise continuous and show how the obtained information permits to improve the understanding in the continuous case.

This is a joint work with

Carmen Nunez, University of Valladolid, carnun@wmatem.eis.uva.es

Rafael Obaya, University of Valladolid, rafoba@wmatem.eis.uva.es

Martin Rasmussen, Imperial College London, m.rasmussen@imperial.ac.uk

Christian Pötzsche and the Department of Mathematics look forward to seeing you at the talk!