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*Global dynamics of systems with steep nonlinearities*

We discuss a novel approach to obtaining mathematically rigorous results on the global dynamics of ordinary differential equations. We study switching models of regulatory networks. To each switching network we associate a Morse graph, a computable object that describes a Morse decomposition of the dynamics. In this talk I show that all smooth perturbations of the switching system share the same Morse graph and we compute explicit bounds on the size of the allowable perturbation. This shows that computationally tractable switching systems can be used to characterize dynamics of smooth systems with steep nonlinearities. This talk is based on a joint work with T. Gedeon (Montana State), S. Harker (Rutgers), K. Mischaikow (Rutgers), and H. Oka (Ryukoku).