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Break of Chaos in Dynamical Systems: Scalar and Spatial Models

It is well known that as the intrinsic growth rate r increases, the logistic and the Ricker map exhibit an irreversible period doubling route to chaos. If a constant positive perturbation to a Ricker model is introduced, then there is a break of chaos giving birth to a two-cycle (usually through a series of period-halving bifurcations). We study this phenomenon for various models and also in a spatial setting where each cell of the lattice is influenced by its nearest neighbours only. Chaos is not observed for r large enough, and the spatial Ricker model with a uniform positive perturbation can incorporate cells that experience two-cycle oscillations with stable dynamics at some locations. Other models and configurations are considered, for example, one-directional invasions.

This is a joint work with my M.Sc. student Jeff Haroutunian.