Locating absolute and convective instabilities in reaction diffusion type systems, and implications for invasion processes

Jens Rademacher (CWI Amsterdam)

Instabilities on the real line and large domains can manifest themselves in different ways. Convective instabilities can be compensated by weighted spaces while absolute instabilities mean pointwise growth. For homogeneous steady states and wave trains these types can be distinguished by the complex dispersion relation derived from linearisation. We present some theory and computational methods for locating the arising sets in the complex plane and the onset of instability in the case of reaction diffusion type systems. We then apply a slight extension to invasion processes motivated from predator-prey situations. This allows to compute the extend of spatio-temporal coherence when the invasion process leaves irregularities behind.

Main references:

- With B. Sandstede, A. Scheel: Computing absolute and essential spectra using continuation. Physica D 229 (2007) 166-183
- With J.A. Sherratt, M.J. Smith: Locating the transition from periodic oscillations to spatiotemporal chaos in the wake of invasion. Proc. Nat. Acad. Sc. 106: 10890-10895 (2009), and: Absolute stability of wavetrains can explain spatiotemporal dynamics in reaction-diffusion systems of lambda-omega type. SIAM J. App. Dyn. Sys. 8 (2009) 1136-1159