

APPLIED DYNAMICAL SYSTEMS SEMINAR

From BS to KS and beyond: Dissipativity and pattern formation

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Attempts to capture salient features of cellular flame instabilities have led to a variety of beautiful mathematical models of a very geometrical nature. The most famous of them is the Kuramoto-Sivashinsky (KS) equation. Its lesser relative is the Burgers-Sivashinsky (BS) equation (which is just a linearly forced Burgers equation). The linear dispersion relations for both equations admit exponential mode growth for a range of long waves. Nonetheless the equations are dissipative due to the nonlinear mixing. For the purposes of this talk, dissipativity is understood as the property that the eventual time evolution of solutions is confined to a bounded (actually compact) absorbing set. The principal subject of this talk is yet another, recently introduced model of quasi-steady evolution of cellular flames, the Quasi-Steady equation (joint work with M. Frankel, IUPUI). In a sense, QS is intermediate between BS and KS, as its dispersion relation coincides with that for BS for short waves, and is virtually identical to that of KS for long waves. Similarly to KS, QS demonstrate a very rich dynamical behavior (note that BS has more or less trivial dynamics). The proof of dissipativity and generalizations to elliptic pseudo-differential operators will be discussed.