Localized patterns in a reaction-diffusion system with mass conservation

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We deal with a two-component reaction-diffusion system with conservation of mass, which comes from a biological model for the cell polarity. While this system allows a Turing type instability, the asymptotic state of solutions as $t \to \infty$, observed by a numerics, shows a simple spatially localized pattern. We reveal some stability property for equilibria of the system by a Lyapunov function and a spectral comparison argument based on the minimax principle, in consequence the numerical observation mathematically justified. Moreover, we show a profile of the stable solution in one-dimensional space converges to a Dirac mass in a singular limit of a diffusion coefficient. This talk is based on the recent joint work with J.-L. Chern and T.-T. Shieh.