New Results for Reaction-Cross Diffusion Equations

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Reaction-cross diffusion systems naturally appear in many fields. We are mainly interested here in a class of systems appearing in population dynamics and which leads to pattern formation. It writes

$$\partial_t u - \Delta_x [d_1(u, v) u] = R_1(u, v) u, \quad (1)$$

$$\partial_t v - \Delta_x [d_2(u, v) v] = R_2(u, v) v, \quad (2)$$

where $d_i := d_i(u, v) \geq 0$, and $R_i := R_i(u, v)$ are polynomial (w.r.t. $u, v$) reaction terms.

Those models include the classical Shigesada-Kawasaki-Teramoto quadratic reaction-cross diffusion model.

We present results of existence of weak solutions for those systems which make use of Lyapounov-like functionals, duality lemmas, and approximation by standard reaction-diffusion equations with relaxation.

The results which will be presented were obtained in collaboration with F. Conforto, Th. Lepoutre, A. Moussa and A. Trescases.


[2] Conforto F., Desvillettes L.: Rigorous passage to the limit in a system of reaction-diffusion equations towards a system including cross diffusion. Accepted for publication in Communications in Mathematical Sciences.