

Fast reaction limit with nonmonotone reaction function

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Abstract

We analyse fast reaction limit in the reaction-diffusion system

$$\begin{aligned}\partial_t u^\varepsilon &= \frac{v^\varepsilon - F(u^\varepsilon)}{\varepsilon}, \\ \partial_t v^\varepsilon &= \Delta v^\varepsilon + \frac{F(u^\varepsilon) - v^\varepsilon}{\varepsilon},\end{aligned}$$

with nonmonotone reaction function F . As speed of reaction tends to infinity, the concentration of non-diffusing component u^ε exhibits fast oscillations. We identify precisely its Young measure which, as a by-product, proves strong convergence of the diffusing component v^ε , a result that is not obvious at all from a priori estimates. Our work is based on analysis of regularization for forward-backward parabolic equations by Plotnikov [2]. We rewrite his ideas in terms of kinetic functions which clarifies the method, brings new insights, relaxes assumptions on model functions and provides a weak formulation for the evolution of the Young measure.

This is a joint work with Benoît Perthame (Sorbonne University, Paris) [1].

References

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- [2] P. I. Plotnikov. *Passage to the limit with respect to viscosity in an equation with a variable direction of parabolicity*. Differ. Uravn., 30:4 (1994), 665–674; Differ. Equ., 30:4 (1994), 614–622.