

ON PULLBACK ATTRACTORS IN H_0^1 FOR NONAUTONOMOUS REACTION-DIFFUSION EQUATIONS

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Abstract

Using a method based on the notion of the Kuratowski measure of noncompactness together with a new way of dealing with well known estimates of solutions we would like to present an elegant proof of the existence of a unique minimal pullback attractor for the evolutionary process associated with a nonautonomous nonlinear reaction-diffusion equation

$$\frac{\partial u}{\partial t} - \Delta u + f(u) = g(t), \quad u|_{\partial\Omega} = 0, \quad u(\tau) = u_0$$

in the phase space $H_0^1(\Omega)$, (Ω a bounded and smooth domain in R^n) in which the nonlinear term satisfies the usual conditions

$$f \in C^1(R, R), \quad C_1|u|^p - C_2 \leq f(u)u \leq C_3|u|^p + C_4, \quad f_u(u) \geq -C_5$$

and the right hand side satisfies quite a weak integrability condition

$$\int_{-\infty}^t \exp\{\lambda s\} \|g(s)\|_{L^2(\Omega)}^2 ds < \infty \quad \text{for all } t \in R, (\lambda > 0)$$

– thus generalizing a number of similar recent results. To get the needed estimates we introduce a general inequality of Gronwall's type which proves useful in other contexts about which we shall mention, too.

Literatura

- [1] Łukaszewicz, G. *On pullback attractors in H_0^1 for nonautonomous reaction-diffusion equations*, International Journal of Bifurcation and Chaos, w druku.
- [2] Łukaszewicz, G. *On pullback attractors in L^p for nonautonomous reaction-diffusion equations*, Nonlinear Analysis, doi:10.1016/j.na2010.03.023