Stability of attractors for impulsive infinite-dimensional semiflows

M. O. Perestyuk and O. V. Kapustyan
Taras Shevchenko National University of Kyiv, Kiev, Ukraine
pmo@univ.kiev.ua, alexkap@univ.kiev.ua

One of the most popular mathematical approaches to the description of evolutionary processes with instantaneous changes is the theory of impulsive differential equations which is originated and developed in Kyiv scientific school of nonlinear mechanics Krylov–Bogolyubov–Mitropolsky [1]. In applications an important class of such systems is impulsive dynamical systems, i.e. autonomous systems whose trajectories undergo impulsive perturbations at the moments of intersection of the trajectories with a certain surface in the phase space. Theory of attractors for infinite-dimensional impulsive semiflows was developed in [2]. In this work we investigated stability properties of uniformly attracting sets of such semiflows. In particular, for wide classes of dissipative infinite-dimensional impulsive problems

$$\frac{du}{dt} = Au + \varepsilon F(u),\ u \notin M,$$

$$u|_{t=0} = u_0 \in X,$$

$$\triangle u|_{u\in M} = Iu - u,$$

we prove that for sufficiently small ε the corresponding impulsive semiflow $G_\varepsilon : R_+ \times X \to X$ has uniform attractor Θ_ε and

$$\Theta_\varepsilon = \overline{\Theta_\varepsilon \setminus M}, \quad D^+(\Theta_\varepsilon \setminus M) \subset \Theta_\varepsilon,$$

where $D^+(A) := \bigcup\limits_{x\in A} \{y \mid y = \lim G_\varepsilon(t_n, x_n),\ x_n \to x,\ t_n \geq 0\}$.

1. Samoilenko A. M., Perestyuk N. A. Impulsive differential equations. – Singapore: World Scientific, 1985.
2. Perestyuk M. O., Kapustyan O. V. Global attractors of impulsive infinite-dimensional systems. Ukrainian Mathematical Journal, 2016, 68, 517–528.