Finite-dimensional reduction of nonautonomous systems

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Our aim in this talk is to study the existence of finite-dimensional attractors for nonautonomous dissipative systems (i.e., we assume that the time appears explicitly in the equations, typically, in the volume forces). There exist, for such systems, essentially two approaches. The first one, initiated by A. Haraux and further developed by V.V. Chepyzhov and M.I. Vishik, is based on the so-called uniform attractor and consists in studying attractors for an autonomous system in an extended phase space. The second one, the so-called pullback attractor, consists in constructing a time-dependent set of attractors which attract the trajectories in a pullback sense. Now, both approaches present some defaults, namely, an artificial infinite dimensionality for the uniform attractor and the (natural) question of the forward convergence for the pullback attractor. We show here that the concept of an exponential attractor allows to obtain a satisfactory theory of finite-dimensional attractors for nonautonomous dissipative systems. This is a joint work with M. Efendiev and S. Zelik.