

DYNAMICALLY GRADIENT DYNAMICAL SYSTEMS UNDER PERTURBATIONS.

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The aim of this lecture is to study the stability of dissipative gradient semigroups (dynamical systems) under perturbation and the equi-attraction properties for their attractors. With this in mind we introduce the class of dynamically gradient semigroups, show its stability under perturbation and prove that the dynamically gradient semigroups are gradient semigroups. Extending the results of [2], the equi-attraction properties for gradient semigroups under perturbations is then obtained and, from it, a rate of convergence for the attractors in terms of the proximity of the semigroups is given. Some evidences of what sort of bifurcation (as the parameter varies) may change the rate equi-attraction for the attractors are given.

This lecture is based on the works [1,3,4].

References

- [1] ARAGÃO-COSTA, E. R., CARABALLO, T., CARVALHO, A.N. AND LANGA, J. A. Stability of gradient semigroups under perturbations. *Nonlinearity*, **24** 2099-2117 (2011).
- [2] A.V. BABIN & M.I. VISHIK, *Attractors of Evolution Equations*, North Holland, Amsterdam, 1992.
- [3] CARVALHO, A.N., CHOLEWA, J.W. Exponential global attractors for semigroups in metric spaces with applications to differential equations. *Ergodic Theory and Dynamical Systems*, *Accepted for publication*.
- [4] CARVALHO, A.N., LANGA, J. A., An extension of the concept of gradient systems which is stable under perturbation. *J. Differential Equations*, **246** (7) 2646-2668 (2009).

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