Local and Global Lyapunov Exponents Revisited

By A. Eden

Abstract. A topological theory of local and global Lyapunov exponents for abstract dynamical systems was introduced by Eden, Foias and Temam [2] in the late 1980's. Although the theory was developed in order to obtain better dimension upper estimates for the global attractors for dissipative and/or damped PDE's, it had more conclusive results for low dimensional dynamical systems such as the Lorenz system of ODE's. Three questions were posed in a conference in Luminy in 1989 seems to have led to some interesting research.[1] A series of results by Leonov in 1990's led to the positive resolution of the third question about the local Lyapunov dimension of the Lorenz attractor. [3]

There has been a renewed interest in the field by Leonov, Kuznetsov and co. (see e.g. [4,5]) In my talk, I will take a nostalgic journey from the beginning of this theory to some of the more recent results. The talk will not be technical.

1. Eden, A, "*Local Lyapunov exponents and a local estimate of Hausdorff dimension*", Attractors, inertial manifolds and their approximation (Marseille-Luminy, 1987). *RAIRO Modél. Math. Anal. Numér.*23 (1989), no. 3, 405--413.

2. Eden, A, ; Foias, C. and Temam, R., "*Local and Global Lyapunov Exponents* " , Journal of Dynamics and Differential Equations, **3**, 133-177, 1991.

3. Leonov, G.A. and Lyashko, S. A., "*On Eden's conjecture for Lorenz System*", 1993, Vestnik, vol. 1, no.3, 9-15.

4. A Yu Pogromsky, G Santoboni and H Nijmeijer , "*An ultimate bound on the trajectories of the Lorenz system and its applications*", 20 June 2003 • Nonlinearity, Volume 16, Number 5.

5. Leonov, G. A. and Kuznetsov, N. V., "*A short survey on Lyapunov dimension for finite dimensional dynamical systems in Euclidean space*", 2016, arXiv:1510.03835.