

The role of global manifolds in the transition to chaos in the Lorenz system

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The Lorenz system still fascinates many people because of the simplicity of the equations that generate such complicated dynamics on the famous butterfly attractor. This talk addresses the role of the stable and unstable manifolds in organising the dynamics more globally. A main object of interest is the stable manifold of the origin of the Lorenz system, also known as the Lorenz manifold. This two-dimensional manifold and associated manifolds of saddle periodic orbits can be computed accurately with numerical methods based on the continuation of orbit segments, defined as solutions of suitable boundary value problems. We use these techniques to give a precise geometrical and topological characterisation of global manifolds during the transition from simple dynamics, via preturbulence to chaotic dynamics, as the Rayleigh parameter of the Lorenz system is increased.

This is joint work with Bernd Krauskopf (The University of Auckland) and Eusebius Doedel (Concordia University, Montreal).

References and Literature for Further Reading

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- [3] E.J. Doedel, B. Krauskopf and H.M. Osinga, Global bifurcations of the Lorenz manifold, *Nonlinearity* **19**(12) (2006) 2947–2972.