Bounding the chaotic region in three-dimensional systems: Lorenz and Rössler models

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In this talk we focus our attention on the use of numerical and analytical techniques in the study of three-dimensional continuous dissipative systems. In the numerical studies we mainly use three Chaos Indicators to give us some guarantee on the computed results: MLE (Maximum Lyapunov Exponent), OFLI2 [**?**] and the 0–1 test. Note that the OFLI2 and the 0–1 tests are much faster than the MLE and permits to study large regions in the space of parameters. These techniques permits us to "estimate regions with regular or chaotic behavior. In all the numerical tests we use an specially designed Taylor series method that gives a fast, accurate and stable method [**?**].

With the numerical techniques we study in detail the paradigmatic Lorenz model, giving a three-dimensional model of the chaotic region that gives some explanation of the findings in [**?**]. After the numerical studies we give some analytical estimates of the boundary of the chaotic regions [**?**]. Finally, some of the above techniques are also applied to the Rössler model and we present some bifurcation analysis (local bifurcations of codimension 1, 2 and 3) on this problem that completes the recently analysis published in [**?**].

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