

Analysis of an On-Off Intermittency System with Adjustable State Levels

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Abstract: We consider a chaotic system with a double-scroll attractor proposed by Elwakil, composing with a second-order system, which has low-dimensional multiple invariant subspaces and multi-level on-off intermittency. This type of composite system always includes a skew-product structure and some invariant subspaces, which are associated with different levels of laminar phase. In order for the level of laminar phase be adjustable, we adopt a nonlinear function with saturation characteristic to tune the range of a certain state variable so that the number and position of the laminar phase level can be arbitrarily controlled. We find that there exist many interesting statistical characteristics in this complex system, such as the probability distribution of the laminar lengths with $-3/2$ exponent in the power law and random jumping of the system trajectories.

Keywords: on-off intermittency; multi-state; invariant subspace; control analysis; statistical analysis;

AMS Subject Classification: 37C70; 62J09; 93C10;

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