Nonlinear Processes
in Geophysics

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Discussions

Interactive comment on "Linear and Non-linear Stability Analysis of the Rate and State Friction Model with Three State Variables" *by* N. Sinha and A. K. Singh

Anonymous Referee #1

This paper begins by looking at a class of rate and state friction models for spring-mass systems developed in the 1980s. Basically, it is new in that it deals with 3 state variables in this application. Turcotte among others has shown that in a number of papers that slider-block models can be related to lattice models. Moreover, Gabrielov et al. (1994) Phys. Rev E. 50, 188-197 found 3 element configurations calculating Poincare sections, etc. just as in this new paper. So, this kind of configuration is not really new. The question that emerges is WHY the need to go to such a system; simply saying that 3 degrees of freedom is necessary for chaos is superficial. Are there any PHYSICAL features of the underlying problem that the new models (including their 2 state model) describe that the original 1980s models cannot. There is no connection with the under-

lying physics presented here, and the authors simply use some canned programs to calculate Lyapunov exponents (why do they get more than one; that does not conform with the traditional definition for the Lyapunov exponent) and obtain a fractal dimension of 5.7 (why, when dealing with a 3 degree of freedom system). Indeed, it is not sufficient for them to apply these tools to data generated from their new model without asking what kind of outcomes emerge from the original 1980s models. Furthermore, does this model given any added physical insight into the frictional problem that motivated the original studies? Just because their new model is more complicated does not of itself justify its publication unless compelling reasons emerging from the physical problem of frictional slip etc. as well as a clear identification of the meaning of their MatLab results is provided.