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Hydrology and Earth System Sciences Discussions

Interactive comment on "Pattern dynamics, pattern hierarchies, and forecasting in complex multi-scale earth systems" *by* J. B. Rundle et al.

J. B. Rundle et al.

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We would like to thank the reviewer for his/her detailed and thorough comments on the manuscript.

General comments:

We have added the references to the paper by Rundle et al. 2000 and more recent one by Rundle et al, 2006b, where the details of the model are discussed in full detail, specifically, the mechanisms and underlining geometry.

Specific comments:

A) We believe the existence of power-law dependences in the system defines hierarchical structures in them.

B) We think that the example of neural networks is appropriate here as it mentions the existence of threshold systems in biological systems.

We have changed "statistically identical" to "statistically similar".

We have left unchanged the term “fires” as it also applicable to neural networks, where the notion of threshold is crucial.

We have added the description of the state variable $s(x,t)$ to the text as a time-dependent displacement field. The upper case state variable $S(x,t)$ describes the rate of occurrence of events and distinguishes from the lower case $s(x,t)$ state variable which describes a displacement field.

C) We have eliminated the mathematical framework of former section 2 and combined the remaining text of section 2 with Introduction.

We have added the clarification of Δt to the text.

D) We have eliminated the mathematical framework of former section 2 and combined the remaining text of section 2 with Introduction.

The detailed definitions of the state variables $S(x,t)$ and Ψ are given in the following paper by Rundle et al, 2006b to which we refer in the text.

This is not related to the SOC phenomena but to the ergodic nature of the model.

We have replaced "Brownian noise" with "Brownian walk".

E) The VC model consists of 650 fault segments embedded into an elastic 3D half space. It differs from BK model in several aspects. Specifically, interactions are long range determined by elastic medium. The geometry of the model is specified using realistic fault network in California with realistic frictional properties and slip rates. Further details can be found in Rundle et al, 2006b.

We have eliminated Table 1 to make thing less complicated. Instead we give a ref-

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erence to the paper by Rundle et al, 2006b, where the reader will find details of the geometry and characteristics of faults in California.

F) In the simulations we use observed averaged slip rates from the real faults in California. We also use deduced friction parameters of those faults. The details are given in Rundle et al, 2006b.

We have added a sentence stating that n is an index enumerating eigenmodes.

G) We have eliminated unused references and added two missing references.

Technical corrections:

We have added the definition of the storm category 5 as was suggested.

We have corrected "Travis et al, 2005" reference.

Time t now is in italic.

Footnote link has been updated.

Rundle et al, 2000 has been added.

ENSO abbreviation has been added in Introduction.

The reference Penland 1989 has been added.

We prefer to leave "...warming off the Pacific coast..." unchanged.

The two state variables $s(x,t)$ and $S(x,t)$ have different meaning. This is reflected in the text.

The correlation operator d has been changed to an upper case.

Throughout the text the magnitude variable M now is in an upper case.

The ratio has been corrected to 3/4.

The abbreviation ENSO has been added to Introduction.

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The word "temperature" now spells correctly.

The second instance of the reference Rundle 2004 has been deleted.

The missing title has been added.

The word "dynamics" has been corrected.

The "VC" has been replaced with "Virtual California".

The figures were updated.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 3, 1045, 2006.