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Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "Measuring the seismic risk along the Nazca-Southamerican subduction front: Shannon entropy and mutability" *by* Eugenio E. Vogel et al.

Anonymous Referee #1

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General Comments: In my previous interactive comment (https://www.nat-hazards-earth-syst-sci-discuss.net/nhess-2019-309/nhess-2019-309-RC1.pdf) I emphasized that "the obtained results [by Vogel et al.] are interesting but the presentation does not conform to the existing literature although it uses ideas earlier published by other researchers". In their interactive comment (https://www.nat-hazards-earth-syst-sci-discuss.net/nhess-2019-309/nhess-2019-309-AC1.pdf), Vogel et al. consent to my comments stating that "all of which have been taken into account in the present version of the paper. We explicitly mention natural time now in the text and in the figures; previous literature is quoted". In contrast to this consent, however, in the present version of the manuscript Vogel et al. only partially addressed my comments, as is evident

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from the following example: Having a look on their current figures 3, 4, 5, and 6, their figure captions state that they plot their results versus the sequence of events without clarifying that these plots are versus “natural time” (sequential number of events) as they stated in their interactive comment. Moreover, none of the works that introduced natural time analysis in 2001, 2002 and the relevant book in 2011 (cf. there are the first three works that I recommended in my previous Interactive Comment, see also below) have been included in the list of References. These three works are the following:

[P. Varotsos, N. Sarlis, and E. Skordas, Spatiotemporal complexity aspects on the Interrelation between Seismic Electric Signals and seismicity, Practica of Athens Academy, 76, 294-321, 2001. Available from http://physlab.phys.uoa.gr/org/pdf/p3.pdf]

[P.A. Varotsos, N.V. Sarlis, and E.S. Skordas, Long-range correlations in the electric signals that precede rupture, Phys. Rev. E, 66, 011902 (7), 2002.]

[Varotsos P.A., Sarlis N.V. and Skordas E.S., Natural Time Analysis: The new view of time. Precursory Seismic Electric Signals, Earthquakes and other Complex Time Series (Springer-Verlag, Berlin Heidelberg) 2011]

Specific Comments: First, in line 49 the authors write: “we make use of the seismic sequence itself analyzing . . . consecutive seisms.”. It should be completed as follows: “we make use of the seismic sequence itself, as in natural time analysis (see, e.g., [EPL 96, 59002 (2011)]), analyzing . . . consecutive seisms”.

Second, in line 76, the authors write: “A entropy could be defined in natural time by . . .”. This is not accurate; it should be corrected as follows: “An entropy has been defined in natural time [Phys. Rev. E 68, 031106 (2003)] -being dynamic and not static [Phys. Rev. E 70, 011106 (2004); Appl. Phys. Lett. 91, 064106 (2007)- by . . ..

Third, in line 98, the authors write: “wlzip results clearly increase several months prior to large earthquakes (Vogel et al., 2017).” It should be completed as follows since Vogel et al. in 2017 were aware of natural time analysis of seismicity results “wlzip

results clearly increase several months prior to large earthquakes (Vogel et al., 2017), thus being in accordance with natural time analysis which reveals [EPL 96, 59002 (2011)] that before major earthquakes there is a crucial time scale of around a few to several months in which changes in the correlation properties of physical quantities like seismicity or crustal deformation are observed"

Fourth, in line 155 the authors write: "However, in our case the value of each vector component is the interevent time itself, thus temporal information is still kept in the time series." In my previous interactive comment, I pointed out that one of the major applications in natural time analysis can be found in the paper [Appl. Phys. Lett. 91, 064106 (2007)] which unfortunately has not been included by the authors in the list of References. In this paper, which is just one example, the interevent time itself was used, and in particular the interevent time between consecutive heart beats is studied (see Fig.1 (a),(b) of this paper) in natural time analysis by computing the entropy change under time reversal. Hence, the aforementioned excerpt of the authors should either be deleted, or reworded for the sake of an accurate information od the readers as follows: "In our case, the value of each vector component is the interevent time itself, which has been also used in the natural time analysis of electrocardiograms by considering the interevent time between consecutive heartbeats [Appl. Phys. Lett. 91, 064106 (2007)]."

Fifth, in line 201, the authors write: "but also on the time sequence of the intervals while Shannon entropy depends only on the distribution." In view of my previous comment, the above excerpt should be reworded as follows: "but also on the time sequence of the intervals, which has been also used in the natural time analysis of the consecutive heartbeat intervals, while Shannon entropy depends only on the distribution [Appl. Phys. Lett. 91, 064106 (2007)]."

Sixth, concerning the lines 380-383 (which are the lines 333-335 of the previous version), I have already asked the authors (in my previous interactive comment) to mention natural time which makes clear the difference between Shannon entropy and mutability.

I suggest the following improvement by restoring the lines 333 and 334 of the earlier version and adding a few words concerning natural time in order to make clear the above difference. Thus, this improvement now reads: “The difference between Shannon entropy and mutability evidenced after the recovery time are due to the handling of a static distribution by the former while the latter considers the order in which registers entered in the distribution in accordance with the concept of natural time.” The meaning of the above difference will become clear provided that the following two completions (seventh and eighth) will be available to the reader since they explicitly state that while Shannon entropy is static, the entropy in natural time is dynamic as explained in detail in the two references [Phys. Rev. E 71, 011110 (2005); Appl. Phys. Lett. 91, 064106 (2007)] that are unfortunately missing in the manuscript.

Seventh, in lines 297 and 298, the authors write: “Shannon entropy considers the visit to a state without considering the order in which these visits take place, . . .” It should be completed as follows: “Shannon entropy considers the visit to a state without considering the order in which these visits take place (which is of paramount importance for the entropy in natural time being dynamic entropy and not a static one [Phys. Rev. E 71, 011110 (2005); Appl. Phys. Lett. 91, 064106 (2007)], . . .”

Eighth, in lines 406 and 407 the authors write: “Shannon entropy deals with the distribution as a whole while mutability deals with a sequential distribution of intervals of natural time;”. It should be completed as follows: “Shannon entropy deals with the distribution as a whole while mutability and the entropy defined in natural time (which is dynamic and not static [Appl. Phys. Lett. 91, 064106 (2007)]) deal with a sequential distribution of intervals of natural time;”.

In short, the authors should proceed to the above-mentioned changes to frame their present findings in accordance with the existing literature before the acceptance of the manuscript for publication.

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