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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.

Eugenio E. Vogel et al.

eugenio.vogel@ufrontera.cl

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Referee 2 1.- Concerning with the mutability, the authors do not describe neither properties nor advantages of the wlzip when its compressor is used to analyze time series, can they give information about the relationship with the numerical values of the wlzip and the underlying complexity in a time series? For instance,if the time series is periodic, random or fractal, how the behavior of the compressoris in those cases?

The referee correctly pointed out that we did not present any detail concerning mutability and wlzip since we have presented it in a previous paper (Vogel et al., Tectonophysics, 2017a) and other quoted papers. In addition, a few examples are given in

the Appendix. However, we have now inserted a couple of sentences in the second paragraph of Subsection "Data recognizer" to provide a general description along the line indicated by the Referee. Moreover, the differences and advantages of mutability with respect to Shannon entropy are now discussed in several passages of the paper following the natural time discussions suggested by the other Referee.

2.- Regarding with the 4 chosen zones, why there were consider the epicenters of the largest earthquakes as center of each zone? (as is shown in the table I) Also, the latitudes why were selected with intervals of 4 degrees approximately? Is there some reason from a seismological point of view? The authors should explain why the zone between A and B was not considered in this analysis, I think that this region could be similar with the zone C in the sense that there is not a large earthquake during the study period.

The aim of this article is to analyze regions close to megathrust occurrence in Chile with the wlzip method. In order to meet this main aim we have used seismic data sets recorded close to the epicenter of three large earthquakes occurred in Chile (with moment magnitudes greater than 8.0). This was the reason to define zones A, B, and D. During the analysis it appeared interesting to include the area in between zones B and D since two important plate slides had occurred south and north of this area, to search for any behavior indicating the risk of future earthquakes. Thus, we took this zone without a megathrust in order to compare the results between the three large earthquakes and, as we called, a "calm period". We are aware of the overlap this implies but the main feature is that zone C is free of a seism of magnitude above 8.0, unlike the others. The choice of zones centered in the major earthquake has a geometrical reason, given our interest in studying the information close to such events. Regarding the choice of 4 degrees, it turned out to be a geographical span where enough data could be collected, so that good statistics is achieved. All of the subduction front is of interest, in particular the zone between A and B that you mentioned. However, we thought that only one "calm zone" close to two major earthquakes was more relevant for the purposes of the

present study. The fifth paragraph (new) in the “Data organization” section explains better the zone definition. Thank you for your comment and queries, which helped us to clarify this point.

3.- From figure 1 and table I can be observed that Zone C is almost completely inserted within the zones B and D, so that the corresponding time series of zone C contains information of the respective B and D time series. The authors must clear how they can distinguish the joint information.

This was answered in the previous query. As already said, a new paragraph was added to explain this point. In addition Table II deals with the times covered for each zone which allows us to appreciate that zone C is defined differently, in accordance with its special characteristics and purposes.

4.- The authors wrote that the first bin in the histograms of A, B and D, in the figure 2, represent mainly the activity of the aftershocks after the larger earthquakes occurred within the respective zones. The authors must specify the criterion that allows differentiate between the aftershocks (in terms of the position and time occurrence after a main shock) and the possible background seismicity. Also, the authors do not describe the number of earthquakes occurred during the analyzed period (2011-2017 and 2009-2017 for zone D), and not specify the number of events in their time series.

With respect to the statement about the large number of aftershock after the main earthquake of each zone we have made two comparisons: A) a monthly comparison before and after the main earthquake (possible in zones B and D only as explained in the paper); B) A comparison of the number of seisms for the full zone and the number of seisms for a restricted “square” of only two degrees in each direction around the main seism. This discussion is now included as the fifth paragraph of the “Data organization” subsection of the revised manuscript. As for the main earthquakes in each time series they are represented by stars in figures 3-6: The number of events in each time series was given (and still is) in the third paragraph of this same subsection: 6891, 6626,

2824, and 6356 for zones A, B, C, and D respectively.

5.- In the lower panel, In Figures 3-6, the abscissa labelled ”Events” corresponds to the succession of filtered seisms identified by the same label i used to define ti, nevertheless, in order to clarify the analyzed period, the authors must specify the dates of the periods and the seisms (red stars) referred.

That was a bit complicated since the number of stars is a bit large during the aftershock regime. We have solved your query differently, but pointing to the same goal: we have prepared a Table (present Table II) to interpret in dates the milestones in the abscissa axis of the events panel.

6.- Regarding the comments around the figures 9-12 the authors claim: “The first comment here is evident: these 4 regions present different seismic behaviors so we have to discuss them separately”. The authors only analyzed the inter-event times series, nevertheless, they have to explain clearly what do they understand seismic behavior, because some other seismic parameters like the magnitude, or released energy which are not considered in this study.

Yes, you are absolutely right. Except for filtering we do not deal with magnitude, and released energy is not considered here. We have rephrased this discussion completely. This can be found in the paragraph commenting figures 9-12 indicated by the referee.

7.- In figures 9, 10 and 12 the authors should set up with red stars the dates that identify the date when each large earthquake occurred.

Yes, it was done, and it really helps to recognize the semester with the largest activity. Thanks!

8.- Within the text is cited (Vogel et al. (2017)) and, in the references section there are two papers of Vogel et al. (2017), the authors must to write Vogel et al. (2017a) and Vogel et al. (2017b) to avoid confusion.

Sorry. Yes, it was confusing. It is now corrected. Thank you.

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