The authors present an innovative relationship between the earthquake hazard and the Second Law of Thermodynamics by using the Shannon entropy, H, as a indicator of the changes in the seismic activity of a region.

The introduction is well structured, and it shows the evolution of the entropy concept from the very beginning to the current use in seismology as an indicator of the evolution of a system. The theoretical framework allows to understand the relationship between the entropy and the Gutenberg-Richter law although some steps should be explained better (see comments below). The methodology clearly explains how the variables needed to compute the entropy are obtained. The chosen datasets (northern Chilean seismicity) look adequate to probe the hypothesis although it should be explained better (see comments). The results are well presented and explained although some figures can be improved (see comments). The discussions are clear and meaningful.

The overall quality of the paper is very good, and the results can be interesting to the scientific community.

Specific questions/issues

1. The authors compute in the first part of the results the entropy for the whole catalogue (all depths). However, the number of earthquakes are not equally distributed for all the different depths and the seismic activity distribution is not the same for cortical and subduction or deep earthquakes so why is the reason of computing entropy using all of them if the physics is going to be different for the three depth regions?. The authors should explain why they do this better and if the idea is to demonstrate that the catalogue has to be spitted by depth region maybe even to carry out the fast fourier transform in Figure 6 may arrive to three main frequencies associated to the different entropy behaviour in each one of the three depth regions.
2. Additionally, in Figure 11 you compute the fast fourier transform only to the intermediate depth region. Why? You argue about the apparent periodicity of the entropic signal here but why it has to be periodic? And why only in the intermediate region? I would also see an apparent periodicity in the deep region with a period of about 1500 days. Why there is no periodicity for shallow earthquakes?. The stress loading rate is usually not uniform in time and a large earthquake may change the stress on the adjacent segment changing the seismic activity behaviour. Also the stress drop may change from event to event and the strength of the crust is not usually constant in time either. Therefore, the author should also try to address this.

3. How the uncertainty in magnitude and epicentral and depth location is taken into consideration during the analysis? The authors should also try to explain in the detail about this uncertainty and treatment in the catalogue and in the analysis.

Additionally, I would suggest you take into consideration the following corrections:

Paragraph 40. Sentence no.4. change *entropy is* by *entropy (S) is*

Equation (1) define in paragraph 45 what l and n means (you only have done it for k and Ω)

Equation (4). As in this section you are still in speaking about entropy, I would suggest saying that assuming k=1 then it is possible to define the Shannon information entropy (H) combining equation (2) and (3). That will allow the reader to know exactly why H(p)=-I(p). Can you explain why k=1 is assumed? In this equation also you should explain why you have changed Ω to W (also in equation 5) and define W if it is what you want to write.

Equation (5) in the sentence where τ is a real number called the entropic index I suggest you improve the sentence saying where τ is named the entropic index and can, in principle, be any real number.

Equation (6) and (8). Sometimes you use x to represent the multiplication but others you do not use it, so I recommend removing the symbol x in all the equations.

Paragraph 95. In the sentence: *On the other hand, if we have N earthquakes and n denotes the number of earthquakes with magnitude M* you have to say *On the other hand, if we have N earthquakes and n denotes the number of earthquakes with magnitude equal to or larger than M* because it is needed to match with the Gutenberg-Richter relationship where n has that meaning.

Page 6. First sentence. After the words *the calculation of entropy* I would add between brackets a reference to the equation you are going to calculate)

Figure 1. It would be nice if you can add to the right of this figures two histograms (one with the magnitude frequency distribution and other with the depth frequency distribution)

Figure 8. Add dashed lines to the figure to separate the three mentioned regions.

Figure 10. I would remove this figure because it it the same information as in Figure 11 and Figure 11 is more illustrative than the previous one.