Comments

on the manuscript *"A Homogeneous Earthquake Catalogue for Turkey and Surrounding Region"* by Onur Tan, submitted for publication to *"Natural Hazards and Earth System Sciences"*.

The manuscript is presenting a new earthquake catalog expanding over the period 1900-2017 and covering a very wide region bounded by the coordinates 32° - 47° N, 20° - 52° E.

The compilation of the catalog is based on records of already published earthquake bulletins of international seismological data providers as well as of regional national agencies of Turkey and surrounding countries. There is a special treatment by the author regarding the magnitudes issue in an effort to offer reliable values expressed in the moment magnitude scale. For this reason, five new converting relations are proposed, correlating magnitudes expressed in widely used scales with the moment magnitude scale.

Finally, the magnitude of completeness of the catalog is defined, as well as its variation in space and with time.

Accurate catalogs, with reliable focal parameters (epicenters, focal depths), homogenized regarding the magnitude, are valuable tools, especially for studies regarding seismic hazard assessment. Therefore, the topic of the manuscript is of interest to the readers of the journal. However, in my opinion, there are serious handicaps, which I describe in the following sectors.

In general:

It is not clear which is the procedure followed by the author to adopt the epicenter coordinates and the focal depths for each event of the catalog. Why for earthquakes occurred far away from Turkey the solutions of Turkish seismological centers are considered as more reliable than solutions offered by regional centers operating close to the epicentral area?

Furthermore, there is an extensive description regarding the magnitude homogenization procedure. However, this procedure is not quite clear. Is the finally adopted magnitude coming after a single magnitude conversion following the hierarchy described in the manuscript? Is it a mean value of all available converted magnitudes? Is it a weighted mean?

In addition, there are problems in the quality control of the catalog. Figures 7 and 8 are contradicting each other as in the first one the cut-off magnitude (completeness magnitude) is Mc=2.9 (it is not clear if it corresponds to the period 1964-2017 or 1900-2017) while in the second one, and before ~1995, the Mc is clearly greater than 3.0.

Finally, the on-line part of the catalog is not representative at all. There are not enough cases of recent earthquakes with more than one available magnitudes in order to test the effectiveness of the process followed by the author.

In details:

1) Although English is not my mother tongue, I would say that English throughout the manuscript is quite poor. Bad English made it difficult (and in some cases

impossible) for me to understand certain parts of the manuscript. I recommend the author to check and correct the manuscript in order to make it more understandable to the reviewers and/or to the readers.

2) The region under study is so wide that is far away from been characterized as *"Turkey and surrounding region"*.

3) In this wide region shallow as well as intermediate depth earthquakes occur. It is well known that their records differ significantly from each other, meaning that there is no way the same converting relations to be applicable for both. There is no mention in the manuscript of any particular procedure followed for intermediate depth events.

4) Line 32: What do you mean *"then they are averaged*"? There are several magnitude estimations reported for each event and expressed in different magnitude scales. How these values have been *"averaged"*?

5) Is there any special treatment for events reported as "explosions" or *"mining activities"* or, in general, for artificial events?

6) Line 105: For such a wide area, the process of final selection of focal parameters for adoption is rather delicate and, in any case, is not sufficiently explained in the text. For example, why solutions from Turkish seismological centers should be preferred for earthquakes occurred in distant regions such as Adriatic, Romania etc. instead of solutions of Italian or Romanian institutes?

7) Line 107: *"The other institutes are used for the local events around Turkey"*. This is contradicting with the previous reference.

8) Line 113 – Figure 2: I am confused. In the text, you mention, *"if there are two or more values for each type, average with standard deviation and median are calculated"*. What do you mean? If there are more than one magnitude values reported in the same scale, what you have done? Have you calculated their mean value? If this is the case then, how do you know how these magnitude values correlate to each other?

9) Line 132: It looks that ISC bulletins were used as the source of Mw values. However, ISC does not estimate moment magnitudes, instead, it includes in its bulletins moment magnitudes from other available sources, such as GCMT (former HRVD), NEIC etc. Have you checked their consistency to each other? There are also reports of seismic moment values in reliable catalogs (e.g. Pacheco and Sykes, 1992; Engdahl and Villasenor, 2002; etc.). Have you used them to enrich the available moment magnitudes in your catalog?

10) I strongly disagree with including in the catalog earthquakes with no magnitudes. Usually such earthquakes are not strong enough to give reliable recordings that are necessary for a robust estimation of focus and/or magnitude. In such a case, their focal parameters could be questionable, contaminating the final product.

11) Figure 4: Searching the ISC data-base for the period 1900-2017 and for the region that you have used I found 22,970 mb values reported by ISC and a total of 33,607 reported by ISC & NEIC. The respective numbers of Ms values were 4,557 & 12,716. Even though these numbers do not agree with the respective ones in the histograms of figure 4, it is more likely that you have also used magnitudes other than ISC. Have you checked their compatibility to each other (i.e. mbISC/mbNEIC and MsISC/MsNEIC) before considering them as a priori equivalent?

12) Line 162: What is the reason to check each magnitude scale's completeness in a catalog? The completeness check has a meaning if it is performed in a homogenized (with respect to magnitudes) earthquake catalog in an effort to reveal its quality characteristics.

13) Line 163: What do you mean *"averaged magnitudes"*? How can there be averaged magnitudes for each scale (!) and for each earthquake? It is not comprehensive what exactly is that you have done. Please, clarify.

14) Line 201: This difference is expected, since ML starts underestimating for magnitudes over ~6.0 and undergoes saturation for values over ~6.5 (e.g. Heaton et al., 1986). It has also been shown that Ms exhibits rather bilinear behavior becoming equivalent to Mw for Ms≥6.0 (e.g. Heaton eat al., 1986; Scordilis, 2006). Such a behavior is also visible in the graph of figure 5. You should take it into account.

15) Line 214: What do you mean by *"priority saturation order"*? Which was the procedure applied when there were more than one converted magnitude values available? Have you adopted the converted Mw* value following the hierarchy of table 1? Have you used a mean value of all converted magnitudes? A weighted mean value? You must be clear about that.

16) Lines 228-229: Fig 5a and fig 5b must be renamed to Fig 6a and Fig 6b, respectively.

17) Line 250: What do you mean by the term *"pre-instrumental period (1900-1964)"*? The term is completely inappropriate. There were installed seismographs during this period in the study region. The same expression is also met in the caption of figure 7.

18) In Figure 8b it is obvious that the value Mc=2.9 for the magnitude of completeness does not hold for the whole period. I would say that it could be considered Mc=3.0 since 1995 or Mc=3.1 since 1978 and, maybe, Mc=3.4-3.5 since ~1968. So two maps should replace the map of figure 8: one for the period 1968-1978 and the second for 1978-2017. Relative adjustments are also needed for figure 7.

19) I believe that the sample of 500 events with 480 events overlapping (moving step of 20 events) forms a very strong filter, which "hides" temporal changes of Mc values (Fig 8b).

20) Line 277: The change in detectability of networks after the 1999 Izmit earthquake is not visible, probably due to the strong filtering that has been applied in sampling.

21) In my opinion, the first paragraph of *"Discussion"* is not needed at all. I suggest you delete it.

22) Line 325: *"On the other hand, a truncated final earthquake list using a magnitude threshold is not useful for the researchers who not familiar details of earthquake catalogues and want to analyse or map whole instrumental period seismic activity in a region".* I disagree. Researchers less familiar with data could be misled by using earthquake catalogs with non-complete data. In my opinion, completeness of data must be considered as a prerequisite for a published catalog. However, incomplete data could be included in the catalog, provided they do not have zero magnitudes (equivalent to Mw).

23) Appendix A: It looks that well-known published catalogs, global and regional, have not been considered (e.g. Papazachos and Papazachou, 1997, 2003; Pacheco and Sykes, 1992; Karnik, 1996; Engdahl and Villaseñor, 2002 etc.). They are not even mentioned in the manuscript.

24) Line 411: Correct reference Galton… 1896 to Galton… 1869.

25) Appendix B: In column 2 replace "Mount" with "Month"