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# ***Interactive comment on “Long-term variability of storm surge frequency in the Venice Lagoon: an update thanks to eighteenth century sea level observations” by F. Raicich***

**F. Raicich**

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R: Reviewer’s remark

A: Answer (pages, lines of the ‘difference’ manuscript, attached as Supplement).

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R: 7467 and 7468. All this historical part is very attractive. I think it would be worth including a picture showing the manuscripts (if there is a limited number of Figures I think that the paper can perfectly done without Figure 5). How was the digitization done? Did the author do it himself? This is a very time consuming task, I think it

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deserves a more detailed description.

A: A new Figure 2 has been included between old Figures 1 and 2 (page 18) that shows sample pages of Temanza's and Vianelli's data; references to the new figure are provided at page 4, line 12 and page 5, line 11, respectively. Fig. 5 is kept to allow the reader to know not only about the monthly data availability, but also when a data source exists (dot) or not (no dot). I think that this information is useful. The digitization was simply done (by myself) by typing in the data from copies of the manuscript (Venice) and from scans of the books pages (Chioggia). I think that a description of the digitization process is not really relevant, since no particular tools were used.

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R: Figure 2. Why does the author choose those two periods in particular? Why is he only showing data for Chioggia? How could we get a glimpse on how the elimination of erroneous data is done in Venice?

A: Figure 2 contains examples of the comparison between observations and the astronomical tide, to show that the agreement is reasonable. There are no special reasons, except, perhaps, that one is a calm period and the other one is stormy. Venice has just the two daily extremes without times of occurrence and a similar comparison cannot be done. Both Chioggia and Venice data were checked visually and Chioggia data also by comparison with the astronomical tide. A sentence has been added which explains the results of the data check (page 7, lines 2-4).

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R: 7471 (actually 7472), 20-30. Discussion on the inverse barometer effect: From the data presented I cannot really say whether the data proves that the sea level data have good or bad quality. In principle, I would expect similar correlation coefficients and similar inverse barometer regression coefficients. But I do not know whether they are comparable or not. This could be sorted out if the author included a confidence interval

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for the regression coefficients. Otherwise, in my opinion all this discussion does not add anything really relevant to the paper.

A: No doubt that the quality of the 18th century data (both sea level and pressure) is low compared to modern data, but the key point is if, in spite of that, they are useful. It has been made explicit (also following a remark made by Dr. Woodworth) that reasonable correlation and inverse barometer coefficients would not be found if either sea level or pressure data (or both) were “bad” (page 8, lines 25-27). The consistency check is based on this concept. Concerning similarity, the inverse barometer coefficients estimated with old data are significantly different (at  $p < 0.05$ ; using the statistical slope comparison tool in [www.danielsort.com/statcalc](http://www.danielsort.com/statcalc)) from those estimated from modern data. However, this does not mean that old data are worse. The text has been rearranged and sentences have been added to clarify this point (page 9, lines 6-15).

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R: 7472 (actually 7473), 11. I would start a new paragraph with “It is possible to compare old and modern daily sea level ranges”. It is independent from the previous discussion on the inverse barometer effect.

A: Done. It was a mistake (page 9, line 19).

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R: 7473 (actually 7474), 14. You mean “19th-20th century observations” instead of “20th century observations” (you mention the 1873-1882 period).

A: Yes, “19th” was missing. Corrected (page 10, line 24).

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R: 7477 (actually 7478), 4-7. It would be nice to know if the author has some clue about where to find this information. Is it realistic to expect that Tamanza and Vianelli took care of the vertical references?

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A: I am sorry, but I have no specific clues, otherwise I would have tried to recover the data. In the 18th century observers were not hydrographers or oceanographers, therefore data might be included in manuscripts about almost any kind of natural science, engineering and medicine. The Venice sea level data analysed in the paper are included in a “meteorological data” section in the Padua archive, and Chioggia data are one of the few exceptions in the Ephemerides of the Meteorological Palatinian Society, which essentially used to collect atmospheric observations. This means that data may be found in unsuspected sources and a systematic search is sometimes extremely difficult. The available information about vertical references is reported in sect. 2.1. Both the observers were educated persons, but, whereas Vianelli says that his data were measured relative to the sea floor, which should have changed very little in 15 years, Temanza does not say if his data were relative to a fixed vertical reference, namely an engraved “Comune Marino” mark, or to the variable algae belt edge. Perhaps this kind of information can be found in other documents.

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R: Figure 3. I have the same concern that Dr. Woodworth. What has happened with the extreme event in 1792? Why does it not appear in the Figure?

A: The event is missing because it belongs to the October 1792- March 1793 period, which is incomplete because observations end in December 1792. A sentence at page 10, lines 8-10 has been included to clarify that only complete seasons are taken into account.

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In addition:

The reference to Temanza’s manuscript has been corrected, as well as that to the Padua archive that holds the manuscript (references; acknowledgements).

Because of the addition of a new Fig. 2, references to (old) Figs. 2-6 have been

modified to (new) Figs. 3-7, respectively.

A few mistypes have also been corrected.

Please also note the supplement to this comment:

<http://www.nat-hazards-earth-syst-sci-discuss.net/2/C3400/2015/nhessd-2-C3400-2015-supplement.pdf>

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Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., 2, 7465, 2014.

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