

Interactive comment on “Analysis of the risk associated to coastal flooding hazards: A new historical extreme storm surges dataset for Dunkirk, France” by Yasser Hamdi et al.

Anonymous Referee #1

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******* General comments**

It is well known that deriving water levels for large return periods using limited duration of observation can result in very significant errors. In this paper, the authors attempted to address this issue for the city of Dunkirk through the collection of long-term historical data. Although this approach is not really a first of its kind, it is still extremely interesting and valuable, and as such, it could be considered favorably for publication, provided that the authors address the two main concerns (and minor issues, see below) that I have regarding this paper:

1-The authors state in the abstract that the aim is to demonstrate the technical feasibil-

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ity of including long-term historical information to improve the statistical assessment of extreme water level return periods. But what is really technically challenging when doing this? It is indeed challenging to find old HI, and the authors really deserve to be thanked for this valuable effort. But what is at least as challenging (in my opinion) is to answer this kind of questions:

-to what extent are the storm surge dynamics that occurred hundreds of years ago representative of the actual level of risk?

-Has the bathymetry, topography, or land cover of the studied area evolved since then, and what could be the impact on storm surge dynamics?

-How accurate are the historical water level data, considering, for example, potential sea level rise, land subsidence, uncertainties relative to the distinction between over-flowing and overtopping when assessing maximum water levels, etc?

Answering these questions could be extremely difficult, but I think that the authors should at least discuss them in the paper.

2-This study (as others) relies on one extremely strong hypothesis: the maximum water level is supposed to be spatially homogeneous, not only in Dunkirk, but also for the nuclear plant in Gravelines, 20km away. To what extent can this assumption be considered realistic? For example, tide gauges generally do not capture the whole wave setup component of the surge, which can vary by a few dozens of centimeters between a harbor, and nearby beaches. They also generally poorly capture infragravity waves, which have been observed in many places along the shoreline of France and can have huge impacts on coastal flooding. The bathymetry and topography can be also quite different in Dunkirk, and 20km away from the city. Considering the very high stakes, it is hence important I think to address these issues (or at least to discuss them) in the paper.

***** Specific comments

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Line 23: "Dunkirk site, representative of the Gravelines NPP": this statement should be tempered or discussed in greater details, as mentioned above.

Lines 117-119: it is unclear whether or not you have already built a complete historical database for the entire French coasts (at least Atlantic and English Channel). Please reformulate.

Table 1: please specify (when possible) where exactly the water and surge levels were obtained (at tide gauges? Dikes? in the streets? In houses? in areas exposed to waves or not?). It would be also interesting to know for each case to what extent the values could be affected or not by wave setup, wave run-up, or overtopping. If an area at a given altitude is flooded because of overtopping, it should not be treated the same way as if it was flooded by overflowing for example).

Please do the same whenever possible for Tables 4-5

Lines 267-268: "A POT threshold equal to 0,75m [...] is an adequate choice". Please give at least a few indications or a reference to explain how you came to choose this value.

Lines 445-446: this seems to suggest that some historical data (for the 18th century for example) have been collected but were not used in this paper. Why? If the purpose of this study is really to demonstrate the technical feasibility of a long-term historical study, then it is more important to describe this kind of information than computing new extreme water levels. On the other hand, if the objective is to do these computations, then all the available data have to be taken into account.

***** Typographical-technical corrections

There are a number of typographical corrections that need to be done. You will find a few examples below. Please carefully proofread the paper again before submitting a revised version.

The term "marine flooding" or "marine submersion" can be found here in many sen-

tences. Although it is used in a number of papers (especially in those written by french-speaking authors), it is not always considered as "proper english". It might be preferable to use "coastal flooding" or "storm surge" instead, as in the title.

Line 17: please define HI in the abstract

Line 39: does not

Line 59: if they had occurred

Line 72: why "unfortunately"? Outliers are information. As you mention in the paper, having an outlier indicates that a simple extreme analysis using limited water level data might induce large errors. Better to know that beforehand.

Line 116: have encouraged

Line 117: that occurred

Line 120: is to collect HI about storms and storm surges that occurred

Line 159: that occurred

Line 166: and elsewhere: please choose between "Dunkerque" and "Dunkirk" in the paper, or indicate clearly in the introduction that both names refer to the same location.

Lines 195-196: exceeded 2.25m, reaching 3.90m at Harlingen, Netherlands. Large areas...

Line 202, 371, and others: therefore

Line 323: have a lower

Lines 325-326: used in the (...?) of

Line 361: that occurred

Lines 668-673: the reference "Hamdi et al 2014" is given twice

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Line 740: please indicate in english the meaning of TAW

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