

Dear Referee #2,

Thank you so much for reviewing our paper.

The manuscript will be, therefore, modified to consider your constructive comments. In the following, a point-by-point response to your comments will be presented.

Point-by-Point response / reviewer # 2

Yasser Hamdi

Comment	Responses to comments
Abstract:	
<p>‘Tide and extreme SSs are considered as independent?’ This sentence is disconnected from the previous one. What do you mean exactly? The previous study assumes the independence between SSs and tides? I don’t understand the authors would study the dependence while they assume that “Tide and extreme SSs are considered as independent”.</p>	<p>It was assumed in the present paper that the tide and storm surge are independent <u>in an extreme value context</u> and a convolution model has been applied with a simple sum of them in the indirect method (with both, skew storm surges and maximum instantaneous ones).</p> <p>Indeed, the general goal of the present paper is to characterize the hazard “coastal flooding” by combining the high-tide and extreme storm surges (SSs & MSSs). A dependence analysis was conducted despite the fact that the study aims to use only the extreme values of these variables. Scatter graphs and the Spearman’s Rho have been used to measure the statistical dependence between high-tide and extreme SSs. It was concluded that this dependence is weak and sufficiently low to consider the variables of interest dependents.</p> <p>The following sentence is now used:</p> <p>In the Abstract, as suggested by one of the reviewers, the sentence “Tide and extreme SSs are considered as independent” in the abstract is now replaced by: Lines 11-12: “Most existing studies are generally based on the assumption that high-tides and extreme SSs are independent.”</p> <p>In addition, In the Methods section:</p> <p>Lines 147-148: “Indeed, as mentioned in the introductory section and as it will be discussed later in this paper, extreme levels such as MSSs may be only very weakly dependent with high-tides.”</p> <p>The discussion section (lines 291-293 and 302-308 with figure 7) has been changed to add a discussion on the dependence analysis.</p> <p>Another kind of dependence that caught our attention (but more important for the coincidence model) is the one between the high-tide and the other instantaneous storm surges around the high-tide (± 6 hours). The Spearman’s Rho was used as a measure of this statistical dependence. A further discussion about this issue section is now added to the paper.</p>
<p>General comment 2: In the introduction, the authors discuss at length different types of other hazards happening in coastal areas (pluvial, fluvial floods) but this is not further looked into in the paper. If I understood correctly, the present study is on extreme sea levels and therefore extensively discussing about pluvial and fluvial floods seems</p>	<p>We agree that discussing other flooding sources was a bit exaggerated. A part of this discussion is now removed.</p> <p>Rainfall data characteristics are likewise removed from table 1.</p>

out of the scope in my opinion. Similarly, it was not clear to me why the authors present in Table 1 the rainfall datasets if this is not used in this study.	
in line 11 ‘Tide density? ‘ What do you mean by tide density	The tide is not distributed randomly and its density can be used instead of a distribution function.
The abstract does not reflect the main results of the work!!	The main results of the work are now presented in the abstract (24-26)
Introduction	
A very long sentence, difficult to understand! ‘This goal is in line with the recent literature (e.g. Idier et al., 2012) challenging the use of the SSS and clearly demonstrates the importance of conducting extreme value analyses with maximum instantaneous ones. In order to achieve this goal, a third fitting procedure to estimate extreme sea levels using the maximum SS (MSS) between two consecutive 100 tides is introduced with an application so that it can be compared with the two first procedures.’	I admit that the two sentences must be better expressed. Lines 126-128: “This goal is in line with the recent literature (e.g. Idier et al., 2012) challenging the use of the SSS and clearly demonstrates the importance of using the maximum instantaneous surges (MSSs) instead.” and, Lines 128-130: “In order to achieve this goal, a third fitting procedure to estimate extreme sea levels using the MSSs between two consecutive tides is introduced with an application so that it can be compared with the two first procedures.”
It would be better if the choice of the Le Havre station can be justified: may be for the important interaction of the different driven forces induced by fluvial, tidal and wave activity.	The following sentence is now added (the last of the introduction): Lines 139-140: “One of the most important features of this case study is the fact that the lower parts of Le Havre city are likely to be flooded by coastal floods and that the region has experienced important storms during the last few decades.”
Methods:	
What’s MSS? What’s JPM? It would be better if you can introduce clearly this!!	Thank you for this comment. MSS is the maximum instantaneous storm surge between two high tides and JPM is the joint probability method (a convolution between tide density and the surge distribution function). These definitions are proposed in the introductory section.
Also, I have not understood how do you determine the SSs from the instantaneous measurements? The total sea level provided by tides is the sum of the SLR component, the long-term geological component, tides and the residual; Do you have considered the long-term components?	May be the reviewer means how do you determine the MSSs from the instantaneous measurements? AS defined in the introductory section, MSS is the maximum hourly storm surge in each tidal cycle. But if the reviewer means the skew storm surge (SSS), it is the difference between maximum observed level and maximum predicted level in each tidal cycle. It is defined in the introductory section as follows: Lines 89-90: “It is the difference between the highest observed level and the highest predicted one, for a same high tide. These maximum levels can occur at slightly different times.” As it is a difference between two total levels, this definition takes only the water rise du the meteorological conditions.
Also, another important issue can be raised here. We can consider that the residual part as the surges, which is the dominant component sure but it’s not the only one for this case Le Havre where the stochastic signal contains both surges and the fluvial effects! May be this should be signaled in the methods and the discussion.	The following sentence is now added to the method section. Lines 166-168: “It should also be noted that for the case Le Havre the residual part as the surges is not the only one and despite the fact that it is the dominant component, the stochastic signal also contains the fluvial effects.”
Again, I raise the necessity for readers, not expert if this area, to have the full	A description of the different abbreviations used is now provided.

description of the different abbreviations used!!! So, it will be better to introduce at the beginning of use each term!	
In relation with the use of the time series of LE Havre, how do you process the gaps?	In the calculation of the effective duration, we take into account: <ul style="list-style-type: none"> – The declustering tool used in independent events extract takes into account the presence of the gaps. – The presence of gaps is also considered in the settings of the POT frequency model. Indeed, after threshold selection, the effective duration of observations (in years) is calculated by subtracting the gaps periods: the effective duration is then the ratio between number of days with observations and the average number of days in a year (365.25)
How do you have determined surges? By harmonic analyses?	The surges time series were already available. They were calculated in another framework.
Line 150 of page 5: “This feature makes the MSS a variable particularly useful for carrying out a PFHA exploring the entire tidal signal, not only the high tide”. MSS value is paired with the high tide value within each tidal cycle? Then, the MSS could not occur always randomly within the tidal period. This approach could overestimate the extreme levels, I think.	Yes indeed, it could overestimate the extreme levels if the MSS does not occur randomly within the tidal period. The probability of coincidence would make it possible to conclude if the MSSs occur randomly in a tide cycle or not and it must be tested for many coastal systems (with different physical properties). On the other hand, overestimating extremes, if it occurs, allows us to be more conservative in the nuclear safety field. But it is not our objective to overestimate the extreme sea levels.
line 157: As suggested, the variable of interest would be the maximum sea level between 2 high-tide values. So, my doubts is the following: Did you sample by the use of POT with the consideration of some independence window criteria or by the use of GEV?	The POT frequency model has been used after a declustering step.
Results Lines 253-251: variables are missing!	Ok. It’s now fixed.
Page 6: what’s the final threshold selected and the peak number used to fit the distribution in each case	These settings are now presented in table 2 (and figure 5).
Page 6 (line 193) the use of ‘storm surge RLs’ , do you refer to be water return levels?	Yes. Changed.
Page 6 (line 197) the delta method. Please can you explain what ‘s this?	The following sentence, with the appropriate reference, is now added to the end of the paragraph before the last one of the section results: Lines 251-253: “It is interesting to note that the delta method (<i>Ver Hoef, 2012</i>) is a classic technique in statistics for computing confidence intervals for functions of maximum-likelihood estimates. The variance of RL estimates are calculated using an asymptotic approximation to the normal distribution.”
The results section should be more detailed, may some illustrations are required in this stage!	More results and discussion are now presented in the paper.