Response to Referee #1 of our manuscript entitled **Coastal Impacts of Storm Gloria (January 2020) over the Northwestern Mediterranean** [nhess-2020-75] submitted to *Natural Hazards and Earth System Sciences*.

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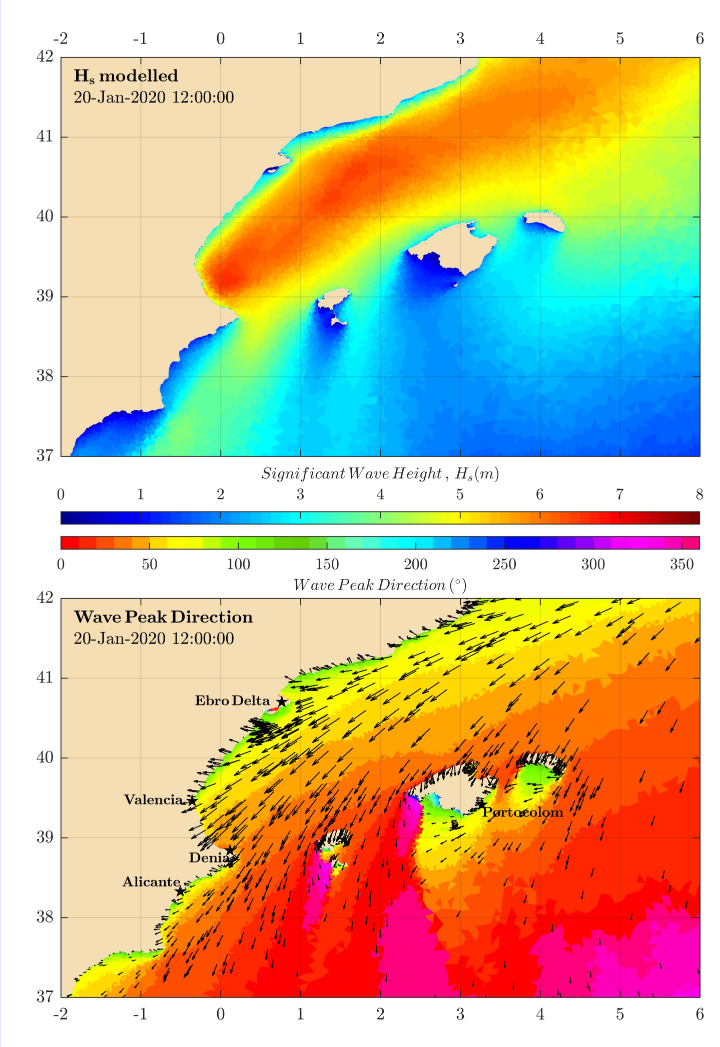
Author's response: We would like to thank the Reviewer for the comments provided. We have responded point by point to all the concerns raised below, with indication of the changes in the manuscript:

The reviewed manuscript "Coastal Impacts of Storm Gloria (January 2020) over the Northwestern Mediterranean" is a numerical study on storm surge, primarily using SCHISM for hydrodynamics and WWM-III for wave dynamics. A baseline 2D model was set up and validated considering the compound effects of wave, atmospheric pressure, and wind. The contribution from each effect were investigated individually by sensitivity tests. Locally high-resolution was implemented in the 2D mesh for a coastal site; a 1D non-hydrostatic model was implemented for another local region with high cliffs using SWASH. The simulation results of Storm Gloria were analyzed and then put into a historical context. The research is the earliest model study on Storm Gloria. The set up and validation of the numerical model are rigorous. The discussion on individual contributors of the total surge, spatial variabilities and historical context are of scientific and practical importance. I find the manuscript very well written. It generally meets NHESS's standard (attached in the previous page); only minor revisions are required.

Specific comments:
1) The authors should try to expand on the analysis of the spatially varying wave contributions to the total surge, specifically on why there are two hotspots (Ebro Delta and Denia in Figure 6b) along the coast. In Section 3 (Ln 194), Ebro Delta and Denia are found to differ from other alongshore regions in wave contribution ($>$ 20 cm, compared to mostly $<$ 7 cm elsewhere; 40-50% of the total surge, compared to mostly ¡10% elsewhere, as estimated from Figure 6b). Is this pattern related to shoreline geometry, topography/bathymetry, or forcing? Does mesh resolution have anything to do with it (seems not, since Denia is not refined)? Please elaborate either before or within Section 3.1; a short paragraph or 2-4 sentences will do.

Author's response: To illustrate our response we have produced the Figure below, that maps significant wave height (H_s, top panel) and wave peak direction (D_p, bottom panel) at the time that Storm Gloria hit stronger along the coast of the mainland (January 20^{th}, 2020). As the reviewer states the maxima wind-wave contributions to the total surge in Denia and the Northern side of the Ebro Delta is a physical effect linked to the wave direction. It is not related to the grid resolution since, as the reviewer noted, the area around Denia is not refined. These two spots were the areas where the waves hit the coast more perpendicularly and, consequently, the wave setup was larger. We thus conclude that the observed pattern in these two spots is a combination of the forcing (with large H_s and that direction) and the shoreline geometry, coinciding with the direction perpendicular to the forcing. We have added a paragraph explaining this fact just before section 3.1, following reviewer's advice.



2) A short paragraph needs to be added in Section 4, summarizing the major accomplishment and findings of the current work. Right now, the last paragraph (which I assume serves as the conclusion) only slightly touches the current work in the 2nd sentence.

Author's response: We have re-arranged the last section, now including a paragraph where we summarise the main findings of the present study.

Technical corrections:

1) Ln 55: consider adding some background for the two selected localities. Did you select them arbitrarily as long as they differ in morphology and forcing? Are they the most severely impacted area? Do they have any significance in agriculture, human residence, or wild life habitat? Some aspects are mentioned later, but a brief description here before delving into the modeling work would be nice.

Author's response: We selected these two locations based on a combination of two factors: differences in morphology and in the forcing, as stated in the text. In addition, for the local studies we needed high resolution topo-bathymetries to perform the local studies, that are not available everywhere but they were for these two areas.

We have included some background of these two spots in the introduction (second-to-last paragraph).

2) Ln 62: discusses the results and "provides" the final remarks.

Author's response: This change has been introduced.

3) Ln 86: More details should be provided on the model setup, e.g.: dt, bottom friction, etc. Also consider showing the computation speed, e.g., number/type of cores and the ratio of simulation time to real time.

Author's response: We have included more information about the model setup in the first paragraph of section 2.2

4) Ln 94: use the multiplication symbol instead of "x".

Author's response: This change has been introduced.

5) Ln 120: "m" should be in normal font.

Author's response: This change has been introduced.

6) Ln 121: provide a brief explanation on why a non-hydrostatic model is needed here in addition to the coupled SCHISM-WWMIII model, so that readers with less background can follow.

Author's response: We have included a sentence in lines 129-131 explaining the reason why a non-hydrostatic model is needed at this point (last paragraph of section 2.2).

7) Ln 135: because model results were not interpolated onto observation points, the authors should provide the maximum distance among all pairs of observation and model grid points.

Author's response: The distance between the location of the buoys and the closest model grid point has now been included in the Fig. 3 as insets in the panel of the H_s ($\Delta d =$...). The values range between 68 m and 1.7 km. This is referenced at the beginning of section 2.3.

8) Ln 141: Add one or two sentences, providing possible causes of underestimating Hs.

Author's response: Possible causes are a poor quality of the atmospheric forcing, a bad performance of the numerical model or inaccurate bathymetry. To test the model performance, we repeated the simulation with the SWAN wave model and obtained the same outputs, so this cause can be discarded. The atmospheric forcing slightly underestimates the wind during the peak of the storm (see Figure 1 in S.M), which might have an effect together with the possibly limited representation of the bathymetry. We have now included a brief discussion of these possible causes in section 2.3 (second paragraph).

9) Ln 158: "cm" should not be italic.

Author's response: This change has been introduced.

10) Ln 158: provide possible causes of underestimating elevation at Tarragona. Uncertainties in forcing, DEM, etc.?

Author's response: We believe that when approaching the coast the major source of error is the bathymetry, which is likely not accurate enough. We have included a sentence in this respect at the end of section 2.3.

11) Ln 197-202: [no corrections needed] If differentiating river flooding and storm surge is of interest to the authors, there are some recent publications on compound flood modeling using SCHISM and WWMIII.

Author's response: Thanks to the reviewer for the heads up. We will check these publications.

12) Ln 277: . . . a mistral sea storm "with" maximum significant wave height . . .

Author's response: This change has been introduced.

13) Figure 6: put the subplot labels (a,b,c,d) into the titles.

Author's response: This change has been introduced.