

Nat. Hazards Earth Syst. Sci. Discuss., referee comment RC3
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Comment on nhess-2022-67

Anonymous Referee #3

Referee comment on "A coupled modelling system to assess the effect of Mediterranean storms under climate change" by Riccardo Alvisè Mel et al., Nat. Hazards Earth Syst. Sci. Discuss., <https://doi.org/10.5194/nhess-2022-67-RC3>, 2022

General comments

A coupled hydrodynamic (2DEF) and wave (SWAN) model is presented. The model is tested for storms in Calabaia beach by including sea level rise and extreme wave projections. The coupled model is assessed against results from Mike model.

One of my main criticisms to this work is that the results of the coupled hydrodynamic and wave model are evaluated against another model (Mike). Throughout the whole text the English expressions need to be reviewed and corrected and representation of results and figures need to be improved. I also suggest editing the title to be more specific.

Specific comments

Abstract: The abstract is so general and does not include that Mike model is used for assessing the couple hydrodynamic and wave model.

Line 12: Please explain what you mean by "wave and hydrodynamic inshore field"

Introduction: The introduction is about three pages long and most of the sentences are off topic. It does not provide enough information about the topic of the paper: coupled modelling. I suggest rewriting this section while focusing on relevant literature and putting them in the context of this study.

Line 21: I suggest rewording the sentence: "Coastal areas contain a wide amount of life"

Line 39: I suggest rewording the sentence: "sea stormy conditions"

Line 58 & 59: "This is particularly significant in case of micro-tidal environments, such as the Mediterranean Sea, where extreme events are expected to be superimposed to SLR scenarios, exacerbating the flooding hazard even in the case of a possible storminess reduction."

Please explain the logic of this sentence. The word "micro-tidal" refers to small tidal range, how can that be a reason for "exacerbating the flooding hazard".

Line 84: Please explain what you mean by "the design of maritime works"

Line 103: "The most important recent storm"

Please explain what makes the storm "the most important".

Line 124 to 126: "Apennines run along the whole region from north to south, consisting of five main ranges, namely, Pollino, Catena Costiera, Sila, Serre, and Aspromonte, characterized by peaks heights between 1,500 m and 2,000 m (Federico and Bellecci, 2004)."

Please explain how this study is related to Apennine Mountains?!

Line 146 & 147: Here you are referring to ERA, while in Line 102 you have referred to ERA-Interim. Which one has been used in this study? The temporal resolution of ERA5 reanalysis is 1 hour, please explain why 6-hour resolution is used in this study. Also add information about the spatial resolution.

Line 151 to 153: "Although the actual performance of wind-wave models is generally good, for closed basins (i.e., the Mediterranean Sea) winds forcing is generally underestimated, with a significant impact on wave modelling due to the lack of knowledge of detailed physiographic features."

Please provide references confirming this.

Line 154: "ECMWF wind fields"

Is this ECMWF ERA5 reanalysis?

Lines 153 to 157: Considering that ERA wave data are available in 0.5-degree spatial resolution, please explain how the ERA5 data are matched with the buoy data. Also,

explain the possible reason behind differences between the two sources.

Figure 2: Please explain the horizontal scatter of points in panel b where mean periods from ERA5 are around 3s.

Line 172: Please explain why 2DEF model is used. Defina 2003 is about "Numerical Experiments on Bar Growth". How has that been the best model for hydrodynamics here?

Line 188: "The SWAN grid is included into the boundaries of the 2DEF domain."
This sentence is unclear.

Line 197: "The model grid is closed 4 km north of Diamante"
The sentence is unclear.

Lines 205 & 206: "Specifically, we reproduced seven wave directions (i.e., 165 °N; 195 °N; 225 °N; 255 °N; 285 °N; 315 °N; 345 °N) and, for each wave direction, three significant wave heights (i.e., 4 m; 6 m; 8 m)."
This sentence is very confusing! What does it mean to reproduce 3 Hs for each wave direction?!

Line 246: "hurricanes of category 2"
Please explain what that means.

Figure 5: Where is the study area in this figure?

Figure 6: I suggest separating the wave height, period, and direction into 3 different subplots.

Line 303: "Extreme wave climate study is based on data collection, selection, and analysis"
This sentence seems to be off topic.

Line 412: "The enhancing storm impact on coastal areas have reshaped the history of many urban settlements and communities"
Please rewrite this sentence with better choices of words.

Line 426: "The coupled system improves the performance of the simulation with respect to the uncoupled system. Furthermore, the outcomes are similar to other commercial models, but with a significantly lower computational cost."

Where in the text have these been demonstrated? Please name which commercial models you are referring to.

Technical corrections

Major technical correction is needed in the text, on top please note that there are two 3.3 sections in the manuscript.

References

Defina, A., 2003. Numerical experiments on bar growth. *Water Resources Research*, 39(4).