Natural Hazards and Earth System Sciences Discussions

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Comment on nhess-2022-67

Anonymous Referee #2

Referee comment on "A coupled modelling system to assess the effect of Mediterranean storms under climate change" by Riccardo Alvise Mel et al., Nat. Hazards Earth Syst. Sci. Discuss., https://doi.org/10.5194/nhess-2022-67-RC2, 2022

The article presents and application of flow of wave modelling nearshore Calabaia considering different sea level rise values and offshore wave conditions. I find the application shown in the article interesting but the validity of the applied models and the rationale behind the considered conditions lacking.

As a whole the article needs restructuring, proof- and critical-reading. There are a few buzzwords being applied in a non-coherent way. For instance, what is the meaning of "global risk society" and "Climate change drives potential future sea hazards, as the greenhouse effect is expected to lead to global warming"? Furthermore, a lot of what is stated in the abstract and introduction can be removed as they are not directly related nor motivating the contents. I suggest that the authors rewrite the whole article. Below a few questions and suggestions. The list is not comprehensive, but at least these issues should be addressed before the article can be assessed.

- Line 14: What is the innovative aspect? Not the coupling between waves and hydrodynamics nor considering the effects of SLR on coastal waves and loads, for these you can find many references.
- Lines 17-18: If you are considering projections then it should be the "projected impact" or "impact projections".
- Replace "Sea waves, caused by the effect of local wind climate" with "Sea or wind waves, forced by the local winds'.
- What do you mean with "Interaction between sea and swell waves can cause unpredictably high waves"? How and why is it unpredictable?
- Can "Extreme sea stormy conditions" be replaced with "Coastal extreme storms"?
- Lines 36-38: Please clearly state what you mean with: "sea storms", "sea waves" and "swell waves". How do you refer to (sea+swell) wave conditions?
- Lines 76 to 83 can be removed as they do not contribute to the subject.

- Line 95: ”Sea level and surface currents are driven by sea state,” this is not true. Please rephase or expand acknowledging that sea levels and currents are driven by atmospheric and astronomical forcing.
- Lines 99-101: Please rephrase of expand. The Gumbel distribution could in principle be used to model the annual maxima, not to ‘identify the extreme sea wave conditions” By “sea wave” you mean only wind sea?
- Lines 101-102: I assume that you mean ERA5 and not ERA-interim as it does not cover the full period given. Assuming that it should be ERA5, the quality of the ERA5 data is expected to be lower in the 1950-1979 period. Have you checked whether there are inhomogeneities in the ERA5 data before and after 1979?
- Line 140-141: Define “wave currents”. Are they only in the wave break-zone? Do they exclude direct wind and pressure forcing?
- Line 147: The ERA5 data are available hourly, why do you only consider 6-hourly?
- Lines 201-202: What do you mean with “model is forced by imposing (refer to Fig. 3a): (i) wave climate at the seaward boundary section (yellow dashed line) every 30 minutes”. By climate I understand long-term means or return values and these are generally assumed stationary, not changing every 30 minutes.
- Lines 144-146: I find the description of Lothar incorrect. Can you please check your references or https://en.wikipedia.org/wiki/Cyclone_Lothar?
- Line 258: Why “CFS reanalysis” and not ERA5, as you are using ERA5 in the study?
- Section 2.6 should be significantly reduced, most of it is copied from the IPCC report. Just refer to it and state the values that will be considered further.
- Lines 245-247: Please rewrite. It is not clear from the text that the models use different numeric schemes and which. Is also confusing to be faced again with “climate”, what do you mean?
- Section 3.1: The return value estimates are not used further. Why are they presented? To motivate the range of values given in line 395?
- Section 3.2: In this section the 2DEF+SWAN results are validated by comparing them with the results of another model and none of the models are validated against observations. The validity of the model results is therefore not verified. The only conclusion/aim appears to be to show that the results are comparable and running times of 2DEF+SWAN lower.
- Section 3.3: There are two sections 3.3. Please correct.