Dear Editor,

Thank you for passing on the further useful comments from two reviewers. We have considered and implemented each comment. Below we respond to each point raised. We believe this paper has been greatly strengthened and we look forward to hearing back from you soon.

Regards,

The authors

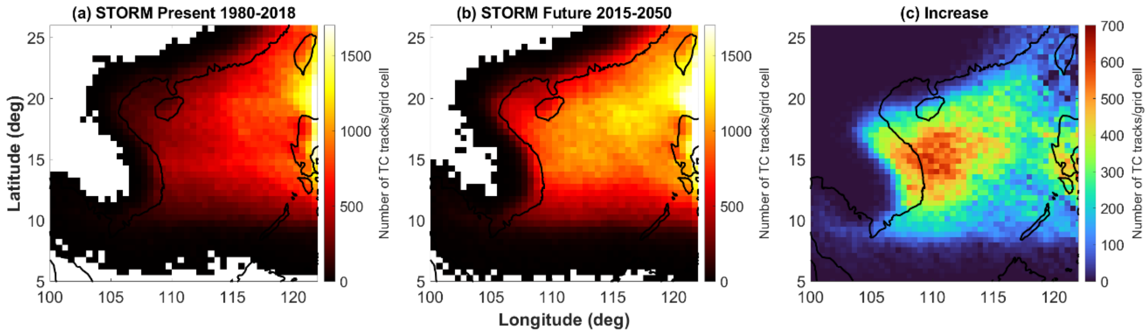
- Reviewer 2 -

Major comments:

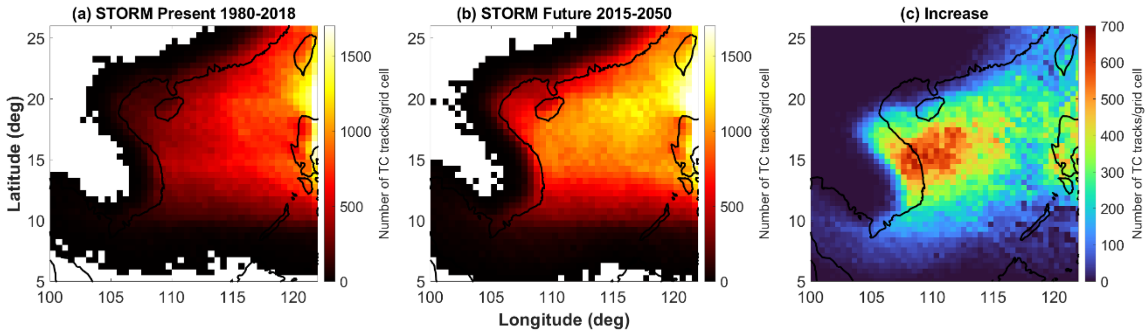
L400/L645/L735: This finding of shifting storms is very interesting. I understand that it was chosen to run (hydrodynamic model) only for CNRM-CM6-1 derived storms for future climate. But I will suggest to do similar analysis as shown in Figure 5 for all other available storm tracks (not necessary to add in the main figure, but consider as supplement if possible) to be more confident about this "shifting storm" trend.

We can confirm that the shifting of TC (and TC-forced storm surge) activity within the South China Sea region is also observed within other climate model track data. Below we show: (a) the original CNRM-CM6-1 climate model results, alongside; (b) EC-Earth3P-HR; (c) HadGEM3-GC31-HM; and (d) CMCC-CM2-VHR4 climate model TC track densities. All show the same impact, to differing degrees, at the Vietnam coastline. We inserted (b-d) of the figure below as a new figure within Appendix 1 (section 4, Figure S8).

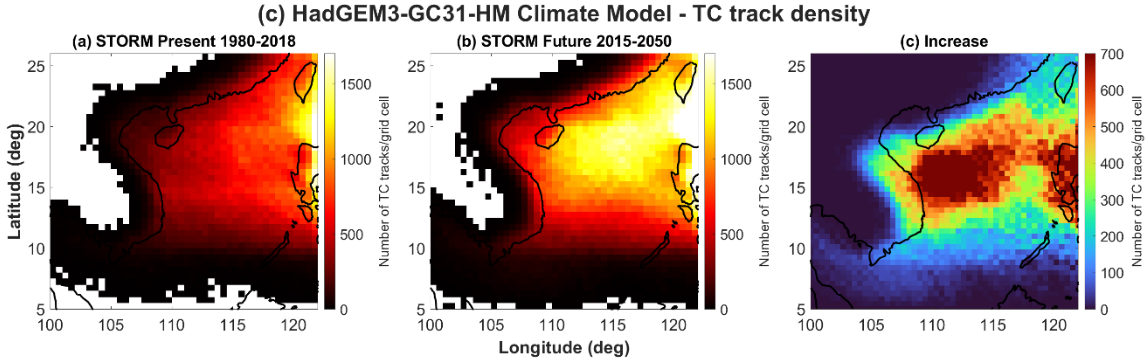
(a) CNRM-CM6-1 Climate Model - TC track density



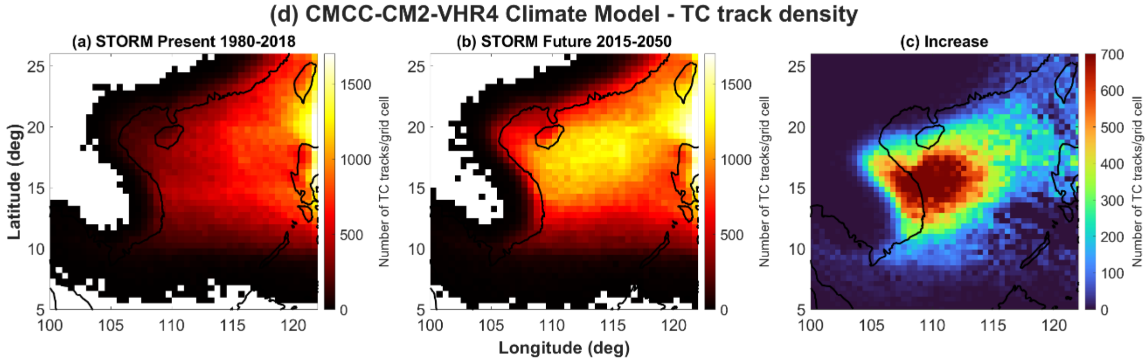
(b) EC-Earth3P-HR Climate Model - TC track density



(c) HadGEM3-GC31-HM Climate Model - TC track density



(d) CMCC-CM2-VHR4 Climate Model - TC track density



2. EVA/Figure 8: I understand that having large number of storm sample immediately reduce the error-bar in the EVA analysis, but I would prefer to have that estimate in the figures (as shaded regions). For example, see study by Leijnse et al. (2022). This is particularly important considering that the error-bar/range associated with sea level rise projection is already quite large.

We have added confidence bounds to Fig 8 showing the total water level return periods. We have 10,000 years of annual (block) maximum storm surge levels, at every point location along the coastline. To better understand the uncertainty inherent in the tide data, for each of these annual maximum storm surge data, we generated a new sample set of total water levels by adding 100 random tides (from a 19-year period -encompassing a complete lunar perigee and lunar nodal cycle) to storm surge level, as described in the manuscript. The solid return period lines in Fig.8 were calculated based on the mean of this 100-sample set. New shaded areas are now inserted into Fig.8 to also display the 95% confidence intervals associated with this mean value. Red shading indicates the confidence bounds for the past/present (baseline) total water levels at each return period, and green shading indicates the confidence bounds for the projected future total water levels by year 2050. In addition, the relative mean sea level rise (SLR) of 0.25 m for this coastline by 2050 has confidence bounds at 0.17 m and 0.35 m (the 17 and 83 percentile range, respectively), in the latest IPCC 6th Assessment report (SSP5-8.5 scenario)**, and this additional uncertainty was added to the future total water level return period + SLR dashed line in each figure (blue shading).

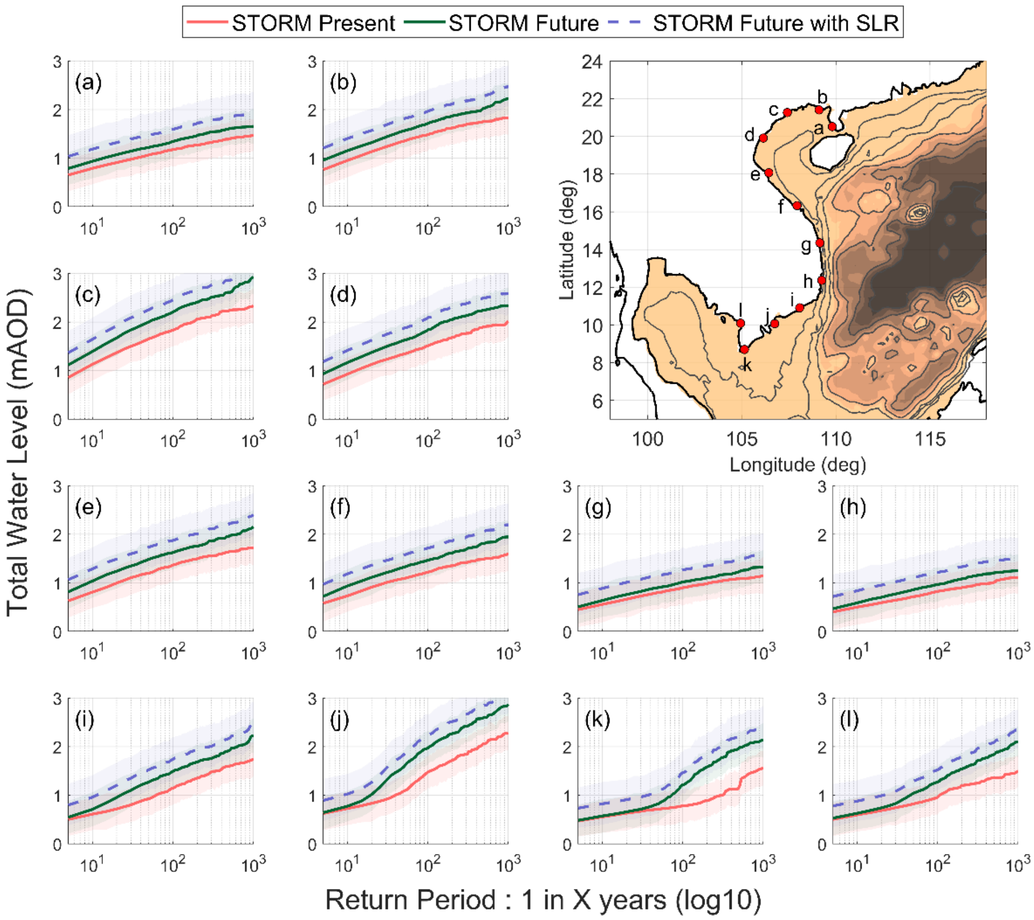


Figure 8 - The relationship between past/present baseline (red) and future (green) total water level return period (Log scale, 1:X years) at equidistant locations at and around the Vietnam and South China coastline. Future return periods with 0.25 mean sea level rise, due to climate change by 2050, is shown with a dashed blue line. Shaded areas indicate the 95th percent confidence level around each mean total water level return period value.

** Median projections of global and regional sea level rise, relative to a 1995-2014 baseline. Data was accessed on 19.04.2023 using the Sea Level Project Tool: https://sealevel.nasa.gov/ipcc-ar6-sea-level-projection-tool

Minor comments:

- Wave contribution: Please refer to Melet et al. (2018) and Dodet et al. (2019). L92 is ok, but L152-L155 Could be removed or can go to the corresponding discussions.

We have incorporated these two new references on wave set up and wind waves, with thanks, and removed lines 152-155, which outline exclusion of wave set up and run up in the model, to avoid repetition.

- L212: Please consider providing the values for default configurations in MIKE21 FM, either in Appendix or in supplement. That will make the study a bit more reproducible (particularly with other models).

We have added an extra table to Appendix 1 (Table S1) with more details of the model set up values, including default values.

- I could not find any mention of model timestep in the manuscript? Is it mentioned somewhere that I missed or it is missing? Please incorporate this valuable modelling info.

Thank you for raising this point, as it is an important consideration in model recreation. To answer, we set an initial overall discrete timestep interval of 3600 seconds in our MIKE 21 FM model. All time steps within the simulation for the various modules are synchronized to this overall discrete time step. Our simulation was run within the hydrodynamic module of MIKE 21 FM. This module used a variable timestep to resolve the shallow water equations with the benefit that the timestep will dynamically adapt to stabilize the model simulation as it progresses. We used a minimum timestep of 0.01 seconds and maximum timestep of 25 seconds (with critical CFL number of 0.8) as bounding limits. This allowed us to create the most stable model possible - given the huge range of extreme wind and pressure fields it had to handle over such a large domain. Furthermore, the time integration and space discretization timestep limits were identically chosen – both following a higher order integration method - to produce a more accurate end result also. We have updated the flow diagram in Appendix 1 to include the model timestep information, and added additional text into Section 2.1 (Model configuration) as below:

> "*The overall discrete model timestep was set to 3,600 seconds (i.e., 1 hourly), however the MIKE 21 FM hydrodynamic module which resolves the shallow water equations over the model domain uses a variable timestep to ensure stability of the model during the simulation. This means that timesteps would reduce further (between 0.01 and 25 seconds)*

as necessary, between outputs, to ensure optimal time integration and space discretization solutions."

- Using Mean Absolute Error, Correlation Coefficient is not a good idea to validate the tide (more precisely the tidal constituents) as they are coupled amplitude and phase (Although using MAE and CC is very common in the literatures). For example two M2 waves separated by minor phase shift will have high MAE (e.g. high error), but also will show high correlation. More useful and compact metric for validating tide is complex error - see Tranchant et al. (2021) for an example. As for the current manuscript, two different tables, and figures are provided with various information - I am accepting it as is. However, please consider using complex error or similar complex metric for tidal validation in the future to be more compact and precise.

Thank you for this advice, the issue of also incorporating complex error analysis is certainly something we will aim to do in future manuscripts, for the good reasons you kindly provide.

*** References**

- Dodet G, Melet A, Ardhuin F, Bertin X, Idier D, Almar R (2019) The Contribution of Wind-Generated Waves to Coastal Sea-Level Changes. Surveys in Geophysics 40:1563–1601

- Melet A, Meyssignac B, Almar R, Cozannet GL (2018) Under-estimated wave contribution to coastal sea-level rise. Nature Climate Change 8:234–239

- Tranchant Y-T, Testut L, Chupin C, Ballu V, Bonnefond P (2021) Near-Coast Tide Model Validation Using GNSS Unmanned Surface Vehicle (USV), a Case Study in the Pertuis Charentais (France). Remote Sensing 13:288