

The Rate of Global Sea Level Rise Doubled During the Past Three Decades

Corresponding Author: Dr Benjamin Hamlington

This file contains all editorial decision letters in order by version, followed by all author rebuttals in order by version.

Attachments originally included by the reviewers as part of their assessment can be found at the end of this file.

Version 0:

Decision Letter:

**** Please ensure you delete the link to your author home page in this e-mail if you wish to forward it to your coauthors ****

Dear Dr Hamlington,

Your manuscript titled "The Rate of Global Sea-Level Rise Doubled in the Past 30 Years" has now been seen by 3 reviewers, and we include their comments at the end of this message. They find your work of interest, but some important points are raised. We are interested in the possibility of publishing your study in Communications Earth & Environment, but would like to consider your responses to these concerns and assess a revised manuscript before we make a final decision on publication.

We therefore invite you to revise and resubmit your manuscript, along with a point-by-point response that takes into account the points raised. Please highlight all changes in the manuscript text file.

In addition to responding to the reviewer comments we ask that you address the following editorial thresholds;

* please detail all methods and error analysis in a new and well-structured methodology section (note that there is no word limit to the methods)

* please add more context and detail to comparisons with the IPCC and the implications for coastal planning and management.

We are committed to providing a fair and constructive peer-review process. Please don't hesitate to contact us if you wish to discuss the revision in more detail.

Please use the following link to submit your revised manuscript, point-by-point response to the referees' comments (which should be in a separate document to any cover letter) and the completed checklist:

Link Redacted

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We hope to receive your revised paper within six weeks; please let us know if you aren't able to submit it within this time so that we can discuss how best to proceed. If we don't hear from you, and the revision process takes significantly longer, we may close your file. In this event, we will still be happy to reconsider your paper at a later date, as long as nothing similar has been accepted for publication at Communications Earth & Environment or published elsewhere in the meantime.

Please do not hesitate to contact us if you have any questions or would like to discuss these revisions further. We look forward to seeing the revised manuscript and thank you for the opportunity to review your work.

Best regards,

Adam Switzer, PhD

Editorial Board Member
Communications Earth & Environment
orcid.org/0000-0002-4352-7852

Heike Langenberg, PhD
Chief Editor
Communications Earth & Environment

EDITORIAL POLICIES AND FORMATTING

We ask that you ensure your manuscript complies with our editorial policies. Please ensure that the following formatting requirements are met, and any checklist relevant to your research is completed and uploaded as a Related Manuscript file type with the revised article.

Editorial Policy: [Policy requirements](https://www.nature.com/documents/nr-editorial-policy-checklist.pdf) (Download the link to your computer as a PDF.)

Furthermore, please align your manuscript with our format requirements, which are summarized on the following checklist: [Communications Earth & Environment formatting checklist](https://www.nature.com/documents/commsj-phys-style-formatting-checklist-article.pdf)

and also in our style and formatting guide [Communications Earth & Environment formatting guide](https://www.nature.com/documents/commsj-phys-style-formatting-guide-accept.pdf).

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All Communications Earth & Environment manuscripts must include a section titled "Data Availability" at the end of the Methods section or main text (if no Methods). More information on this policy, is available at <http://www.nature.com/authors/policies/data/data-availability-statements-data-citations.pdf>.

In particular, the Data availability statement should include:

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- Accession codes where appropriate
- If applicable, a statement regarding data available with restrictions
- If a dataset has a Digital Object Identifier (DOI) as its unique identifier, we strongly encourage including this in the Reference list and citing the dataset in the Data Availability Statement.

DATA SOURCES: All new data associated with the paper should be placed in a persistent repository where they can be freely and enduringly accessed. We recommend submitting the data to discipline-specific, community-recognized repositories, where possible and a list of recommended repositories is provided at <http://www.nature.com/sdata/policies/repositories>.

If a community resource is unavailable, data can be submitted to generalist repositories such as [figshare](https://figshare.com/) or [Dryad Digital Repository](http://datadryad.org/). Please provide a unique identifier for the data (for example a DOI or a permanent URL) in the data availability statement, if possible. If the repository does not provide identifiers, we encourage authors to supply the search terms that will return the data. For data that have been obtained from publically available sources, please provide a URL and the specific data product name in the data availability statement. Data with a DOI should be further cited in the methods reference section.

Please refer to our data policies at <http://www.nature.com/authors/policies/availability.html>.

REVIEWER COMMENTS:

Reviewer #1 (Remarks to the Author):

Dear authors,

I enjoyed reading your manuscript entitled The Rate of Global Sea-Level Rise Doubled in the Past 30 Years that shows the rate of global mean sea level doubled from ~1.9 mm/yr to ~4.4 mm/year between 1993 and 2022 using satellite altimetry data.

These findings are in my view worthy of publication and of significant interest not only to the sea level research community

but also a variety of other disciplines involved in coastal environmental research and adaptation/mitigation strategies. However, the manuscript was clearly written for a shorter format journal and as such its current form lacks the substance articles in Communications Earth & Environment typically entail. I have made these points to the editor with the suggestion of lengthening the manuscript to provide further context to the presented results and their implications for the future after which I would be happy to review again.

Reviewer #2 (Remarks to the Author):

This is a short article that reports on updated rates of rise over the past 30 years as monitored by a series of satellite altimetry missions. A key take-home of the paper is that a single linear rate is no longer appropriate given the scale of the acceleration. The analyses are appropriate and the paper is generally well written and is suitable for publication with some minor clarifications:

1. There is mixing of units throughout the paper (sometimes cm of rise or cm/yr sometimes mm or mm/yr) and this mixing actually leads to some typos e.g., at line 78 these should be mm/yr. I would recommend sticking to a single unit throughout.
2. In places statements are made e.g., line 54 but they are not justified. Why is the 30 year record appropriate (was this discovered post analyses or an underlying statistical requirement?), is it exactly 30 years that was needed or that's what we have but actually 27 or 28 years would have been fine? Some clarification and improvement of the language would help.
3. As above, for lines 58 and 59, why are these two pieces of information critical for planners? To some extent, I would have thought current rate is a) somewhat less useful than future rate and b) this paper deals with GMSL and not localised rates for planners. Whilst this may be the dominant signal on some coasts it will not be on others and of course, the importance of this component will change over time as well as space.
4. Lines 95-96. Absolute amounts since 1993 here would be helpful as well as the rates that are achieved by each date especially as absolute amounts are used later in the paragraph for 2023 relative to 1993.
5. There is some awkward wording in the introduction e.g., at line 21 the satellite record didn't surpass 30 years on the launch of this satellite but it allowed the record to go beyond 30 years. Line 24, just the record length is important here not that it is increasingly long.
6. GMSL needs to follow global mean sea level at line 15.
7. Figure 2. Why decades? The justification for this figure and what it shows and why it is shown isn't clearly drawn out in the text.
8. Why are rates often presented without uncertainties?

Reviewer #3 (Remarks to the Author):

The study presented in this manuscript analyses the most recent satellite measurements of global mean sea level (with some caveats to what is corrected for) and suggests that the oft-touted average rate of sea-level rise over the satellite-era is no longer representative because global mean sea-level rise is accelerating. More specifically, the length of data we now have from satellites (>30 years) has allowed the authors to identify a statistically-significant acceleration, which is an important finding given previous attempts required more sophisticated corrections and had shorter time series to analyse. This result is important and the methods the authors present to argue this are sound. The manuscript is excellently written, which will be important for this observation to reach a greater number of readers from a wider range of backgrounds. I recommend this paper should be published, and I only have a couple of points that the authors may wish to address prior to that. See below:

1) The authors have framed this work as important for future planning for sea-level rise. While I don't disagree with this at all, I think there could be a bit extra to help the reader see the significance of this. What is it about the current IPCC projections that don't account for this acceleration? Or do they do that fine? From a mathematical standpoint I'm not sure how that might differ, so if there is a way of making it more explicit, that would really help the reader. Or, are the authors more referring to planners/policymakers that are not accounting for this? The Hirschfield et al 2023 paper could be a good one to look at for this point.

2) Line 78 values as reported from Figure 2 should be in mm/yr and not cm/yr.

Juliet Sefton

Communications Earth & Environment is committed to improving transparency in authorship. As part of our efforts in this direction, we are now requesting that all authors identified as 'corresponding author' create and link their Open Researcher and Contributor Identifier (ORCID) with their account on the Manuscript Tracking System prior to acceptance. ORCID helps the scientific community achieve unambiguous attribution of all scholarly contributions. You can create and link your ORCID from the home page of the Manuscript Tracking System by clicking on 'Modify my Springer Nature account' and following the instructions in the link below. Please also inform all co-authors that they can add their ORCIDs to their accounts and that they must do so prior to acceptance.

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If you experience problems in linking your ORCID, please contact the [Platform Support Helpdesk](http://platformsupport.nature.com/).

Version 1:

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Dear Dr Hamlington,

Your manuscript titled "The Rate of Global Sea Level Rise Doubled During the Past Three Decades" has now been seen by our reviewers, whose comments appear below. In light of their advice we are delighted to say that we are happy, in principle, to publish a suitably revised version in Communications Earth & Environment under the open access CC BY license (Creative Commons Attribution v4.0 International License).

We therefore invite you to revise your paper one last time to address the remaining concerns of our reviewers. Specifically, please carefully address the requests for more context on your projections for future sea level rise, and ensure that the figures convey the same message as the text.

At the same time we ask that you edit your manuscript to comply with our format requirements and to maximise the accessibility and therefore the impact of your work.

EDITORIAL REQUESTS:

Please review our specific editorial comments and requests regarding your manuscript in the attached "Editorial Requests Table".

*****Please take care to match our formatting and policy requirements. We will check revised manuscript and return manuscripts that do not comply. Such requests will lead to delays. *****

Please outline your response to each request in the right hand column. Please upload the completed table with your manuscript files as a Related Manuscript file.

If you have any questions or concerns about any of our requests, please do not hesitate to contact me.

SUBMISSION INFORMATION:

In order to accept your paper, we require the files listed at the end of the Editorial Requests Table; the list of required files is also available at <https://www.nature.com/documents/commsj-file-checklist.pdf>.

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** This url links to your confidential home page and associated information about manuscripts you may have submitted or be reviewing for us. If you wish to forward this email to co-authors, please delete the link to your homepage first **

We hope to hear from you within two weeks; please let us know if you need more time.

Best regards,

Heike Langenberg, PhD
Chief Editor
Communications Earth & Environment

Adam Switzer, PhD
Editorial Board Member
Communications Earth & Environment
orcid.org/0000-0002-4352-7852

On X(Twitter): @CommsEarth

REVIEWERS' COMMENTS:

Reviewer #1 (Remarks to the Author):

Dear authors,

Thank you for the resubmission of your manuscript entitled The Rate of Global Sea-Level Rise Doubled in the Past 30 Years with results now updated and showing an increase in the rate of sea-level from 2.1 mm/year in 1993 to ~4.5 mm/year in 2023.

As before, I believe these findings are worthy of publication and my only suggestions now are to improve the visual connection between the text and figures to maximize the impact and outreach of your research.

For example, the figure 1 time-series plot, inset and caption show the increase in sea-level of 3.3 mm/year and not message you are trying to convey about the rate increasing from 2.3 to 4.5 mm/year. Furthermore, is the increase in sea-level magnitude during this period that is discussed in the text but not presented in the figure. I have made some suggestions in the annotated pdf for your consideration to improve this.

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In addition to the above, there are a number of minor corrections to address and references that are missing. Please see below for more details.

Thank you.

Abstract:

General comment – the text doesn't say anything about what you did/methods. Consider adding this. May also be a requirement as per CommsEnvr guidelines.

Line 22: "shinning a light" - slightly odd wording for a paper to me...

Line 26: Delete approximately and add ~ before 2.1 and 4.5 values. Also delete now since now would be 2024 not 2023 as stated.

Introduction:

Line 38: Add) after Richter et al., 2020 reference. Currently missing.

Line 54: Fasullo et al., 2012 – cited as 2013 in references.

Line 58: You may consider moving this paragraph up. It's much more impactful to grab the reader's attention than the background info on sat alt records...

Line 83: Fox-Kemper et al., 2021 not included in references. Please add.

Results:

Line 106: A suggestion to strengthen the impact and use of your results for readers by improving Figure 1 from 'just another time series plot' that shows a similar 3.3mm/yr trend. Also, as the figure labels 3.3mm/yr and not the rate of 4.5mm/yr you are trying to convey. Basically, emphasize your results more on the current rate increase. Also perhaps you can include some shaded bars within/outside figure box to indicate the different increases in sea level magnitude (e.g., 12 yrs for 30mm, 9 yrs to 60mm etc) and highlight your beginning and end rates (annotation perhaps).

Line 130: Just a comment about why chose the mid-point to extrapolate from? Perhaps expand a little why.

Line 132: general question - is it correct to compare the 90% CI from the extrapolated sea level with likely ranges? and this is just qualitative?

Line 133: could expand further perhaps? what does the global SSP2-4.5 projection estimate? perhaps you should include some simple summary text for the reader that explains the range amongst the SSP scenarios to 2050. Also maybe improve the figure to highlight this? see comments below on figures.

Discussion:

Line 149: Onto or into?

Line 154: See comments below on the figures as these summary pointers would fare better if they were well represented in the figures.

Methods:

Line 191: Delete glacial isostatic adjustment as already abbreviated above.

Line 194: Maul & Martin (1993) not included in references.

Line 196: Bos et al., 2014 and Royston et al., 2018 not included in references.

Line 198: Caron & Ivins, 2020 not included in references.

References:

Make sure all are included...

Line 287: Willis et al not cited in main text?

Line 290: Von Shuckmann et al. 2020 not cited in main text?

Table:

Line 296: Add GMSL somewhere so rate and acceleration has context.

Figure 1:

Gridded lines are distracting, make them a fainter grey.

Line 314: Solid red line is orange in figure.

The figure needs to emphasize the increase in rate to 4.5 mm/year as per the paper headlines. If one skims to the figure they see the quoted 3.3 mm/year as other papers have previously shown.

Figure 2:

Label panels A and B and change caption accordingly.

You add an inset key for this figure but not for figure 1 or panel b here?

Red here but blue in fig 1? Be consistent with the coloring throughout both figures.

Could remove black dashed and just leave as grey shaded to make figure less busy.

Perhaps think of a better way to link these both panels together as in text you say current trajectory on path similar to SSP24.5. Some simple horizontal shading maybe.

Could colour code SSP ranges as per colours used by IPCC.

What is the clear square at top right in SSP5-8.5 LC?

Line 320: Add Fox-Kemper references after IPCC AR6.

Reviewer #2 (Remarks to the Author):

Many thanks to the authors for addressing previous comments and updating their analyses. The paper reads very well and is an important contribution. A few minor points to consider below:

1. Given the lag times in the system between temperature and sea level, is there any reason to think sea level wouldn't rise at this rate or more? I think as written it leaves some ambiguity in what this sentence is really implying and there is room to make it clearer including the likelihood of this statement e.g., in all likelihood is this a minimum expectation?
2. Related to the above, some of the information in the last paragraph of results on scenarios seems like it might be relevant to be in the abstract?
3. Line 52-56. Perhaps expand briefly here on why this is the case that these temporary swings have a diminishing impact with increased record length? It might not be inherently clear to all readers.
4. Line 157, grammatical issue "by more 169mm". I think missing a than.
5. Lines 159-161. Perhaps link this back to potential impacts of such a rate? For example, there are papers discussing tipping points for coastal wetlands at similar values.

Reviewer #3 (Remarks to the Author):

My comments on the first iteration of this manuscript still stand in that the manuscript is a) well written, b) reads to be accessible to a wide range of readers, and c) an important result that needs to be published (and soon!). My main comment/suggestion to the authors is that I'd like to see a more explicit statement or discussion of the drawbacks of projecting future sea level based on observational trends versus those from physical models. It is alluded to slightly in the final paragraph of the results (i.e., the choice of only to 2050 is intentional, line 136) but I think more detail is needed. I guess what I am asking relates to point #2 in the discussion about 'if this trajectory continues'... is that a reasonable assumption? Yes short-term, but perhaps elaborate on the differences between the AR6 approach and this (perhaps a little more context added in line 163). Not suggesting loads to be added, but a little more context might help readers (in particular those who will report on this in the media) see the difference between this work and the AR6 work.

I have listed a few minor suggestions/clarifications below:

Line 43: perhaps explicitly state mountain glaciers and ice sheets (or land-based ice), rather than 'ice-covered areas'?

Line 106: it took 'about' 12 years... is it 12 years or not? I think you can be precise here given you state an exact amount (i.e., 30 mm).

Line 124: uncertainty estimate decreases – say what that decrease is here or refer to a figure

Line 130: Do you mean amount of sea-level rise by 2050, i.e., the amount of rise from the beginning of the record? I think this sentence can be more specific, or there should be a following sentence that is explicit about the exact result presented.

Line 156: perhaps note uncertainties in here too – I don't think it takes away from the statement.

Line 159: this sentence isn't particularly clear to me – rate of rise?

Line 182: ocean volume – and mass? Perhaps note which GIA model this is (or refer the reader to where they can find the method and details for this part of the analysis given it's an existing dataset)

I'm not particularly familiar with previous approaches to correcting satellite altimetry data so I cannot comment on the validity of the methods outlined e.g., line 198 etc.

Figures 1 & 2: seeing as what constitutes '0 mm' between both figures is different, perhaps the authors would consider a note in the figure 2 caption to explain this difference, as well a note of the time stamp for the beginning of the quadratic fit extrapolation.

Juliet Sefton

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Response to Reviewers

"The Rate of Global Sea-Level Rise Doubled in the Past 30 Years"

We want to thank the reviewers for the helpful comments. As is likely already clear, these revisions have been completed over the course of a year. We apologize for the delay, but provide two reasons for this delay:

- 1) Shortly after receiving the reviews, the satellite altimetry project team made progress in resolving some underlying issues with the record and it was clear an update would be coming that could impact the results in the paper. We decided to wait for this update, which occurred in late 2023.
- 2) Additionally, 2023/2024 was marked by a significant El Niño event. This large event provided an opportunity to test some of our hypotheses and determine the robustness of the acceleration estimates.

We have updated the paper to use the GMSL record through the end of 2023. We have also made other substantial updates in addition to the point-by-point revisions described below:

- 1) We have added to the author list to a) better interpret the uncertainties in the altimeter record, and b) improve the discussion on the comparison to the projections in the AR6.
- 2) We have added additional tests to check the sensitivity of our estimates to the end date of the record.

We think that these changes have made the conclusions in the paper stronger, and updating the record through 2023 allows this study to be more timely and relevant for years to come.

Reviewer #1 (Remarks to the Author):

Dear authors,

I enjoyed reading your manuscript entitled The Rate of Global Sea-Level Rise Doubled in the Past 30 Years that shows the rate of global mean sea level doubled from ~1.9 mm/yr to ~4.4 mm/year between 1993 and 2022 using satellite altimetry data.

These findings are in my view worthy of publication and of significant interest not only to the sea level research community but also a variety of other disciplines involved in coastal environmental research and adaptation/mitigation strategies. However, the manuscript was clearly written for a shorter format journal and as such its current form lacks the substance articles in Communications Earth & Environment typically entail. I have made these points to the editor with the suggestion of lengthening the manuscript to provide further context to the presented results and their implications for the future after which I would be happy to review again.

We thank the reviewer for their comments. We apologize for not being clearer when submitting. Our intention has been to write a focused paper on GMSL and its implied trajectory

and haven't tailored it to a specific journal. That being said, we appreciate the reviewer's comments that the paper could be strengthened with additional content. Here are some specific changes made based on the annotated .doc file.

- Abstract length/detail: we have lengthened the abstract and added more detail to it to better reflect the full scope of the paper. We have also adjusted to mm/year throughout the paper. Our intermittent use of cm and cm/year was confusing.
- Introduction: We have added to the introduction to provide more background and setup the paper better.
- Results: We have changed the structure of the results to provide a better narrative and introduce the main work in the paper.
- Discussion: We have re-structured the discussion.
- We have adopted all specific, smaller changes.

Reviewer #2 (Remarks to the Author):

This is a short article that reports on updated rates of rise over the past 30 years as monitored by a series of satellite altimetry missions. A key take-home of the paper is that a single linear rate is no longer appropriate given the scale of the acceleration. The analyses are appropriate and the paper is generally well written and is suitable for publication with some minor clarifications:

1. There is mixing of units throughout the paper (sometimes cm of rise or cm/yr sometimes mm or mm/yr) and this mixing actually leads to some typos e.g., at line 78 these should be mm/yr. I would recommend sticking to a single unit throughout.

This has been fixed throughout. Apologies for the confusion.

2. In places statements are made e.g., line 54 but they are not justified. Why is the 30 year record appropriate (was this discovered post analyses or an underlying statistical requirement?), is it exactly 30 years that was needed or that's what we have but actually 27 or 28 years would have been fine? Some clarification and improvement of the language would help.

Agreed that this was a poorly constructed statement. We have revised this and other statements to lean on the publication record where needed. We have also added a test to check different record lengths.

3. As above, for lines 58 and 59, why are these two pieces of information critical for planners? To some extent, I would have thought current rate is a) somewhat less useful than future rate and b) this paper deals with GMSL and not localised rates for planners. Whilst this may be the dominant signal on some coasts it will not be on others and of course, the importance of this component will change over time as well as space.

We re-worded these statements throughout and provided better justification for the statements that remain.

4. Lines 95-96. Absolute amounts since 1993 here would be helpful as well as the rates that are achieved by each date especially as absolute amounts are used later in the paragraph for 2023 relative to 1993.

This is a good point. We have made this addition to the discussion just prior to the rates.

5. There is some awkward wording in the introduction e.g., at line 21 the satellite record didn't surpass 30 years on the launch of this satellite but it allowed the record to go beyond 30 years. Line 24, just the record length is important here not that it is increasingly long.
Agreed on both. We have adjusted these.

6. GMSL needs to follow global mean sea level at line 15.

This has been fixed.

7. Figure 2. Why decades? The justification for this figure and what it shows and why it is shown isn't clearly drawn out in the text.

Agreed. We have removed this figure and added a new one based on the end point analysis.

8. Why are rates often presented without uncertainties?

This has been corrected. We show uncertainties for every rate in the paper.

Reviewer #3 (Remarks to the Author):

The study presented in this manuscript analyses the most recent satellite measurements of global mean sea level (with some caveats to what is corrected for) and suggests that the oft-touted average rate of sea-level rise over the satellite-era is no longer representative because global mean sea-level rise is accelerating. More specifically, the length of data we now have from satellites (>30 years) has allowed the authors to identify a statistically-significant acceleration, which is an important finding given previous attempts required more sophisticated corrections and had shorter time series to analyse. This result is important and the methods the authors present to argue this are sound. The manuscript is excellently written, which will be important for this observation to reach a greater number of readers from a wider range of backgrounds.

I recommend this paper should be published, and I only have a couple of points that the authors may wish to address prior to that. See below:

1) The authors have framed this work as important for future planning for sea-level rise. While I don't disagree with this at all, I think there could be a bit extra to help the reader see the significance of this. What is it about the current IPCC projections that don't account for this acceleration? Or do they do that fine? From a mathematical standpoint I'm not sure how that might differ, so if there is a way of making it more explicit, that would really help the reader. Or, are the authors more referring to planners/policymakers that are not accounting for this? The Hirschfield et al 2023 paper could be a good one to look at for this point.

We agree that this wasn't entirely clear in the original paper. Our goal was to indicate how observations and projections can be used in tandem to provide additional confidence in scenario selection. We have updated the manuscript significantly to make this clearer.

2) Line 78 values as reported from Figure 2 should be in mm/yr and not cm/yr.

Juliet Sefton

We have updated the units throughout to be consistent.

Response to Reviewers

REVIEWERS' COMMENTS:

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Thank you.

We thank the reviewer for the comments. We’ve made a number of changes as a result of the feedback and hope the revised manuscript better conveys the key messages of the paper.

Abstract:

General comment – the text doesn’t say anything about what you did/methods. Consider adding this. May also be a requirement as per CommsEnvr guidelines.

We have made clearer reference to the Methods section, and included some additional sentences in the main text to convey what was done.

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This has been fixed.

Line 58: You may consider moving this paragraph up. It's much more impactful to grab the reader's attention than the background info on sat alt records...

We appreciate the suggestion, although have chosen to leave as is to maintain the current flow.

Line 83: Fox-Kemper et al., 2021 not included in references. Please add.

This has been added.

Results:

Line 106: A suggestion to strengthen the impact and use of your results for readers by improving Figure 1 from 'just another time series plot' that shows a similar 3.3mm/yr trend. Also, as the figure labels 3.3mm/yr and not the rate of 4.5mm/yr you are trying to convey. Basically, emphasize your results more on the current rate increase. Also perhaps you can include some shaded bars within/outside figure box to indicate the different increases in sea level magnitude (e.g., 12 yrs for 30mm, 9 yrs to 60mm etc) and highlight your beginning and end rates (annotation perhaps).

We have made revisions to this figure to better articulate the key messages of the paper. These changes are in alignment with the reviewer suggestions above.

Line 130: Just a comment about why chose the mid-point to extrapolate from? Perhaps expand a little why.

The decision here was to align with a) the time period over which the acceleration and rate estimates were made in the preceding analysis and b) to most closely align with the IPCC AR6 projections that are relative to the period from 1995 to 2014.

Line 132: general question - is it correct to compare the 90% CI from the extrapolated sea level with likely ranges? and this is just qualitative?

The comparison made in the paper is qualitative. We do think it is fair to compare the confidence interval to the likely range. The confidence interval of the extrapolation reflects, in part, our ability to extract the long-term, forced trend from the observational record. If this confidence interval fits within the envelope of projections for a given SSP, this is informative for comparison and provides information on the degree to which the altimeter trends reflect a signal we can expect to continue into the future.

Line 133: could expand further perhaps? what does the global SSP2-4.5 projection estimate? perhaps you should include some simple summary text for the reader that explains the range amongst the SSP scenarios to 2050. Also maybe improve the figure to highlight this? see comments below on figures.

We've added some statements and a reference regarding the SSPs.

Discussion:

Line 149: Onto or into?

We've corrected this.

Line 154: See comments below on the figures as these summary pointers would fare better if they were well represented in the figures.

We appreciate the feedback on the figures. We have implemented some of the suggestions and hope they are better as a result.

Methods:

Line 191: Delete glacial isostatic adjustment as already abbreviated above.

This has been fixed.

Line 194: Maul & Martin (1993) not included in references.

This has been added.

Line 196: Bos et al., 2014 and Royston et al., 2018 not included in references.

These have been fixed.

Line 198: Caron & Ivins, 2020 not included in references.

This has been fixed.

References:

Make sure all are included...

Line 287: Willis et al not cited in main text?

This has been removed.

Line 290: Von Shuckmann et al. 2020 not cited in main text?

This has been fixed - there was a typo previously.

Table:

Line 296: Add GMSL somewhere so rate and acceleration has context.

We've clarified the caption to better state what the table shows.

Figure 1:

Gridded lines are distracting, make them a fainter grey.

We have indeed made these fainter grey.

Line 314: Solid red line is orange in figure.

This is now a solid red.

The figure needs to emphasize the increase in rate to 4.5 mm/year as per the paper headlines. If one skims to the figure they see the quoted 3.3 mm/year as other papers have previously shown.

We've added annotations to reflect the change in rates.

Figure 2:

Label panels A and B and change caption accordingly.

This has been done.

You add an inset key for this figure but not for figure 1 or panel b here?

We've added an inset to clarify what the different lines are.

Red here but blue in fig 1? Be consistent with the coloring throughout both figures.

We've made an update.

Could remove black dashed and just leave as grey shaded to make figure less busy.

We have now done this.

Perhaps think of a better way to link these both panels together as in text you say current trajectory on path similar to SSP24.5. Some simple horizontal shading maybe.

Could colour code SSP ranges as per colours used by IPCC.

This has been done.

What is the clear square at top right in SSP5-8.5 LC?

This has been removed.

Line 320: Add Fox-Kemper references after IPCC AR6.

We've made this change.

Reviewer #2 (Remarks to the Author):

Many thanks to the authors for addressing previous comments and updating their analyses. The paper reads very well and is an important contribution. A few minor points to consider below:

1. Given the lag times in the system between temperature and sea level, is there any reason to think sea level wouldn't rise at this rate or more? I think as written it leaves some ambiguity in what this sentence is really implying and there is room to make it clearer including the likelihood of this statement e.g., in all likelihood is this a minimum expectation?

We've tried to clarify this statement. We agree with the reviewer that this would be our expectation.

2. Related to the above, some of the information in the last paragraph of results on scenarios seems like it might be relevant to be in the abstract?

Agreed. We've made this update.

3. Line 52-56. Perhaps expand briefly here on why this is the case that these temporary swings have a diminishing impact with increased record length? It might not be inherently clear to all readers.

Good point. We've added a sentence or two explanation.

4. Line 157, grammatical issue "by more 169mm". I think missing a than.

We have fixed this.

5. Lines 159-161. Perhaps link this back to potential impacts of such a rate? For example, there are papers discussing tipping points for coastal wetlands at similar values.

We've added a sentence with references.

Reviewer #3 (Remarks to the Author):

My comments on the first iteration of this manuscript still stand in that the manuscript is a) well written, b) reads to be accessible to a wide range of readers, and c) an important result that needs to be published (and soon!). My main comment/suggestion to the authors is that I'd like to see a more explicit statement or discussion of the drawbacks of projecting future sea level based on observational trends versus those from physical models. It is alluded to slightly in the final paragraph of the results (i.e., the choice of only to 2050 is intentional, line 136) but I think more detail is needed. I guess what I am asking relates to point #2 in the discussion about 'if this trajectory continues'... is that a reasonable assumption? Yes short-term, but perhaps elaborate on the differences between the AR6 approach and this (perhaps a little more context added in line 163). Not suggesting loads to be added, but a little more context might help readers (in particular those who will report on this in the media) see the difference between this work and the AR6 work.

We thank the reviewer for the continued feedback. We have expanded on this very important point in a number of places. There is a clear difference between this and the AR6 scenarios, and that should be made clear.

I have listed a few minor suggestions/clarifications below:

Line 43: perhaps explicitly state mountain glaciers and ice sheets (or land-based ice), rather than 'ice-covered areas'?

We've made this shift.

Line 106: it took 'about' 12 years... is it 12 years or not? I think you can be precise here given you state an exact amount (i.e., 30 mm).

The reviewer is correct - we've been more explicit.

Line 124: uncertainty estimate decreases – say what that decrease is here or refer to a figure

We've made this change.

Line 130: Do you mean amount of sea-level rise by 2050, i.e., the amount of rise from the beginning of the record? I think this sentence can be more specific, or there should be a following sentence that is explicit about the exact result presented.

We've made this sentence clearer.

Line 156: perhaps note uncertainties in here too – I don't think it takes away from the statement.

We've made this update.

Line 159: this sentence isn't particularly clear to me – rate of rise?

We've re-written this sentence to be clearer.

Line 182: ocean volume – and mass? Perhaps note which GIA model this is (or refer the reader to where they can find the method and details for this part of the analysis given it's an existing dataset)

We've updated this to be clearer.

Figures 1 & 2: seeing as what constitutes '0 mm' between both figures is different, perhaps the authors would consider a note in the figure 2 caption to explain this difference, as well a note of the time stamp for the beginning of the quadratic fit extrapolation.

Good catch! We've clarified why there are different reference points within the paper and figure captions.

Juliet Sefton