

Response to Reviewers, round 2.

**I thank once again both reviewers for their comments and detailed reading of this long manuscript. Also for their positive feedback. Their comments have made this manuscript much better. I have implemented all changes suggested below.**

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## **REPORT #1**

The author has provided a thorough and careful response to reviewer comments, addressing the major issues raised by both reviewers. I think the manuscript is largely ready for publication. It could use another round of careful proofreading.

Here I list typos and syntax issues that I noted as I read.

line 85. Remove "due to" to achieve parallel structure.

line 205. "consist" --> "encompasses" or "comprises"

line 250. "authors" --> "author's"

line 251. "comparable method as" --> "method comparable"

line 263. "Heights" --> "Height"

line 310. "similar as" --> "similar to that"

line 313. "first order" --> "first-order"

line 323. "bit smaller" --> "bit smaller than evaporation"

line 323. "about that" --> "about the same as"

line 331. "die to". Intended meaning is unclear. Maybe change to "of"

line 339. "calculated" --> "converted"

line 350. "to GMSL" --> "to a GMSL"

line 354. To avoid misinterpretation, I would use an Oxford comma: "sensible heat flux, latent heat flux, and long-wave heat flux"

line 357. "between" --> "from"

line 374. "as observed" --> "as the observed"

line 375. "in where" --> "in which"

line 376. "impact" --> "impacts"

line 377. "that from" --> "those from"

line 398. "impact" --> "impacts" (twice)

line 404. missing verb. "decreasing" --> "these decrease"

line 414. "that by" --> "the impact of"

line 437. "that" --> "those"

line 487. "globally integrated" --> "global integration"

line 491. add comma after "neutral"

line 570. "impact GMSL" --> "impact on GMSL"

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## **REPORT #2**

Minor revision: Once the title is adjusted to better reflect the manuscript scope, and the remaining language/typos above are corrected, I recommend it for publication.

The author did a careful revision and provided detailed, point-by-point responses. The revised manuscript is substantially improved. In particular, I appreciate the clearer and more consistent framing of what is evaluated locally versus what is presented as a global integral. Overall, I feel the manuscript is now close to being ready. Thanks again for the thorough effort.

At this stage, I only recommend minor revisions, mainly concerning the title and a short list of remaining typos I found in the revised manuscript.

I thank the reviewer for the kind words.

1) Minor revision requested: Title should better match the scope

While I agree with your strategy to keep the scope as-is (and complement the global integrals with maps of local variations), the title still strongly emphasizes "global mean sea level", which may read as a full GMSL-budget/closure study. Given the manuscript's emphasis on sea-level variations (local patterns) and process attribution, and given the necessary limitations in what can be "closed" observationally, I recommend revising the title to use a more general framing such as "sea level variation" / "sea level variability" / "sea level change". (Also, stylistically, I suggest using "Observation-based" rather than "Observational-based" in the title.)

Below is a consolidated list of items I noticed in the revised manuscript (version 2), with suggested edits.

L41: "observational based datasets" → consider "observation-based datasets" (or "observationally based datasets" for grammar).

L46: "it is neither the intention nor possible at this stage ..." → rephrase e.g., "it is neither the intention nor is it possible at this stage ..." (or "it is neither intended nor possible ...").

L67: "therewith counteract" → consider "thereby counteract" / "thus counteract".

L69: "also know as" → should be "also known as".

L95: "Therefore ocean currents ..." → add comma: "Therefore, ocean currents ...".

L99: "heat (section(2.4))" → fix formatting: "heat (section 2.4)" (remove the extra parenthesis and add spacing).

L101: "Derivations rely heavy on ..." → "rely heavily on ...".

L169: "..., but locally it does change sea level." → consider "..., but locally they do change sea level." (or clearer: "..., but they redistribute sea level locally.").

L176: "also know as" → "also known as".

L185: "one can calculating ..." → "one can calculate ...".

L296: "Meaning there is ..." → "This means that there is ...".

L340: "therewith" → "thereby/thus".

L348: "The net impact ... are about ..." → "The net impact ... is about ...".

L383: "The results in row 11 of Table 2 used ..." → "The results ... use ..." or "were computed using ...".

L390: "depending on the the choice" → delete the duplicated "the".

L398: "... processes are quantified" (referring to "the impact ...") → "... impact ... is quantified".

L566: "The accuracy ... are limited ..." → "The accuracy ... is limited ...". "observational based constraints" → "observation-based constraints" (or "observationally based constraints").

L607-608: same as above

L758: "also know as" → "also known as".

L761: "Analogue to Eq. C7" → "Analogous to Eq. C7"