

Responses to 2nd round of reviews of “QuadTune version 1: A regional tuner for global atmospheric models”

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We thank the reviewer for re-reading the manuscript and making further comments.

The reviewer comments are repeated below in *blue italics*, with responses interspersed in a non-italicized font. Changes to the manuscript text appear in *orange*.

1 Responses to Reviewer

Thanks for taking the time to respond in detail to the comments. I’m mainly happy with the changes made, with some small specific comments below.

In particular, I think the description of what QuadTune is (Section 3) is clearer, and the ordering is fine now that this references ahead. Figure 1 gives a nice illustration. The extension of Section 8 to compare more sensitivities is valuable as well, and whilst the difference between 10.1 and 10.4 is perhaps not large, it’s nice to see that can match the hand-tuned version even more closely with few simulations and a slightly more complex emulator, based around parameter interactions that are most important. I think this is a useful additional demonstration and better shows that the tool is working well.

Thank you.

”As a side comment, we note that even simpler emulators are being published by GMD. For instance, this recently published emulator is linear and doesn’t include any 2nd-order terms! (link removed). Presumably GMD is publishing these simple emulators because some users have very expensive (e.g., high-resolution) atmospheric models, don’t have access to large computing resources, and hence need to make compromises.”

Is it worth referencing this paper as motivation that this is a reasonable approach? E.g., around line 160 mention GPs and PC, but could perhaps reference the fact that simpler approaches are also used — for the reasons you mention here.

This reference is now cited in the manuscript with the following comment:

“However, other authors have gone further and dropped the entire quadratic term, including the diagonal part, in order to reduce the cost (e.g., Petrov et al., 2025).”

“Stating ‘no sum over i ’ is a standard way of clarifying that we’re not using Einstein summation convention.”

I’m not convinced this is necessary as it’s already clear from the summation only being over j (eq 26), or lack of summation notation (31). If using this clarification, for consistency does it then need adding to things like (25)?

(25) does not need to state ‘no sum over i ’ because in (25), the i is not repeated within a term, and hence the summation convention is not violated. There is just one i in each term. However, in other equations in the revised manuscript, we’ve added ‘no sum over i ’ in order to clarify.

Line 151 – it’s clear from context, but maybe explicitly say something like ‘near the optimal parameter values ($p_{1,opt}$, $p_{2,opt}$)’ (like with definition of default values in line 162)

Thanks. Changed as suggested.

Line 549 – ‘they’ instead of ‘he’?

If the manuscript were to use ‘they’, then the pronoun wouldn’t agree in number with the antecedent noun, causing unclarity.

Line 549 – could delete the first ‘or else’ in this sentence?

We prefer to keep both ‘or else’ phrases because it adds clarity.

Table 1 – some are to 1DP, some 2DPs – is 10.3 really 10.30, or 10.25?

We have modified the table and text such that only one decimal place is retained.