

Based on the 1st review phase (interactive discussion), the authors performed several modifications to the manuscript which improve its quality and clearness significantly. However, some aspects are still to be corrected from my point of view. I propose to accept the manuscript with minor corrections.

1. Main comment:

The total length of the manuscript was a point of discussion in the 1st review phase. I completely agree with the authors argumentation that each part of the manuscript is relevant. Indeed, all parts of the manuscript are important and contain interesting results. However, it's a combination of the actual length on paper and the amount of new content and results that makes the manuscript appearing very long. My main concern is that readers get discouraged or lost.

My recommendation is to move less important or "assisting" parts in the appendix - being still easily accessible by the interested reader but reducing the length of the main text. I would suggest one or more of the following parts (or also others depending on the authors argumentation):

A) Sec 2.4 - univariate experiments: The univariate experiments in Sec.2.4 provide a good preparation for the subsequent parts especially for unexperienced readers, but the results are mainly an intermediate step for the interpretation of the multivariate results. Ideally this aspect could be addressed in a preceding publication, but could also be moved to the appendix of this paper. - this would shorten the main text by about 5 pages (in its current version)

B) Sec.3.2 - LV-CTM formulation: While the formulation of the PKF dynamics for the LV-CTM (Sec.3.2.1) and the multivariate PKF analysis (Sec.3.2.5) should stay in the main text, Sec.3.2.2 (evaluation of chemistry alone) and Sec.3.2.3 (contribution of individual terms) are interesting, yet less important parts which are evaluating the enKF results preparing the closure of the PKF equations. Thus, I recommend moving Sec.3.2.2 and 3.2.3 in the Appendix and referring to them in the actual formulation of the PKF closure in Sec.3.2.4 (e.g. adding reference to Sec.3.2.3 in l.555, ...). - this would shorten the main text by about 5 pages (in its current version)

C) Sec.3.3 - LV-CTM experiments: Algorithm 1 provides a good summary, but is rather long. It could also be moved to the appendix because all important steps are described in the manuscript. - this would shorten the main text by about 1 page (in its current version)

From my point of view, B) has more priority to be moved into the appendix than A) unless the authors argue differently.

2. Minor technical corrections:

- related to the 1st review, reviewer1, technical correction 10: There are still some introducing sentences of next sections at end of sections. I suggest removing or moving them to beginning of new section (eg: before Sec.2.4, 2.4.1 ,3.1.3, 4.2)
- related to the 1st review, reviewer1, technical correction 9: Remove technical figure description "blue dashed lines" at l.314 and similarly l.419

- I.43: Suggest reformulating the new sentence starting with "to zero" by moving these two words to the end: "...to set the ensemble estimation of the multivariate correlation to zero, ..."
- I.194: In the current version the title of Sec.2.4 was not changed as described in the 1st review, reply to reviewer1, general correction 2.4
- I.106: Remove "that"
- I.295-297: The complex sentence structure makes it difficult to follow. Do you want to say something like: Because the equation for the mean (Eq.(13)) is linear, the error field is given by an equivalent equation. And for these equation, the shorter the correlation length scale the larger is the error magnitude. ??