

Interactive comment on “EnKF and 4D-Var Data Assimilation with a Chemistry Transport Model” by S. Skachko et al.

S. Skachko et al.

sergey.skachko@aeronomie.be

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[11pt,a4paper]article color

C1

Response to the Anonymous Referee 1

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The author's responses are marked in blue. We first would like to thank the anonymous referee 1 to the useful remarks.

General

This paper represents a unique contribution on the comparison of EnKF and 4D-Var approaches for the assimilation of chemical species. It provides much insight, notably on issues related to inter-species error correlations and localization. I congratulate the authors. I provide here only minor suggested corrections.

Minor corrections:

L16: Change to: “one issue is the large number of . . . ”

Done.

L19: Change “comparison reason ” to “comparison purposes ”

Done.

L182: Change “ will be a subject to ” to “will be subject to ”

Done.

C2

L208: Define PSC

Done.

L211 Do not refer to MACC or define it

The MACC acronym has been defined.

L303 Change “has the background quality” to “includes a background quality ”

Done.

L 501 -504 Apparent contradiction where precision level 14 ppbv seems first to correspond to 38% error at L 501 while at line 503 it corresponds to 250%. This is likely because in the first case it corresponds to 4.6 hPa level while in the other it corresponds to 1 hPa level. Sentence could be clearer.

We have modified the sentence as follows: “...the Aura MLS N₂O precision is 24-14 ppbv (9-38%, relative to the observation mean at given altitude) and its accuracy is 70-3 ppbv (9-25%) in the pressure range 100-4.6 hPa but its precision drops to 14 ppbv (250%) at 1 hPa...”

L 698: why qualify as “tricky ” the Aura-MLS dataset?

We replaced the word with “dubious Aura-MLS N₂O dataset”

L707 End of sentence point needed after 5 hPa.

Done.

L709 “ approaching to them”, define what “them” represents. Not clear as is.

Replaced with “keeping the model closer to the assimilated observations”

L727 Drop the reference to paper in preparation!

Done.

C3

L733: Suggest to change “accidentally ” by “incidentally ”

Done.

L826 Life time of ozone is that small, lower than a model time step presumably of order 15 min?

Indeed.

Conclusion: Perhaps add as comment that an hybrid approach such as popular 4D-EnVar approach could emerge as a good way forward for chemical data assimilation.

The following sentence is added to the last paragraph of the conclusions: “A future development of the BASCOE chemical data assimilation system would be a hybrid 4D-EnKF approach using the ensemble of models to construct a 4D background error covariance matrix.”

C4