

# ***Interactive comment on “Harmonization and comparison of vertically resolved atmospheric state observations: Methods, effects, and uncertainty budget” by Arno Keppens et al.***

## **Anonymous Referee #1**

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Review of "Harmonization and comparison of vertically resolved atmospheric state observations: Methods, effects and uncertainty budget"

by Keppens et al,

## GENERAL COMMENTS

The paper, written by a team of authors who have much experience of comparison of various types of satellite data product and reference measurements, represents a worthy attempt to present a unified framework for all such comparisons, while also giving due recognition to earlier work by other authors who have dealt with more specific aspects.

Unlike the authors, most readers will only be familiar with limited applications of the intercomparison problem, so the challenge is to write a paper general enough to cover the whole field, while also making it understandable to those only working on particular aspects. It's not an easy read, but I don't see how it could be done better, and the flow chart and tables offer useful summaries.

Hopefully this paper will serve as the reference document for future discussions of validation methodology.

## MINOR COMMENTS

I have only minor suggestions for clarifications and grammar

P4 L6: 'which are' instead of 'who are'

P5 Eqs 9,10: Should subscripts in the bracketed terms be 'L' rather than 'N'?

P7 Eq 13: This equation made no sense to me.

P8, L21: Assuming 'prior constraints in terms of prior covariance matrices' is to be taken as a single entity, I suggest removing the comma after 'constraints' otherwise it may appear that measurement weights and prior profile shapes are also in terms of prior covariance matrices.

P8, L23 (and elsewhere): I suggest 'retrieval artefacts' rather than 'retrieval effects' to emphasise that these are unintended rather than intended consequences of the retrieval process.

P8, L24 (and elsewhere): I suggest 'eliminates' rather than 'annihilates' 'Annihilate' has violent connotations (although perhaps the authors do have particularly strong feelings on this matter?).

P11 Eq 23-24: Getting from Eq 23 to Eq 24 doesn't seem obvious. Does this require some trick along the lines of getting from 4.11 to 4.12 in Rodgers?

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