

REVIEW OF ‘A PRACTICAL METHOD TO REMOVE A PRIORI INFORMATION FROM LIDAR OPTIMAL ESTIMATION METHOD RETRIEVALS’

I thank the authors for their thorough and considerate replies to the reviewers comments. They addressed enough of our concerns for this paper to be suitable for publication after a few minor adjustments. I have a conceptual disagreement with the authors on the finer points of optimal estimation (e.g. I have produced several climatological datasets that contain a priori information and they have been used to evaluate trends; one has to be careful about not overusing the prior but it's possible and, in my opinion, preferable). However, the preference to minimise the influence of a priori information on data is held by the majority of scientists I've met and this isn't the place for that fight. I hope to one day encounter the authors at a conference and exchange opinions over a drink.

Minor comments:

P5L22 I don't see a clear statement of $\mathbf{A} = \mathbf{GK}$.

Fig.5 (An observation, not a matter needing action.) I am of the opinion that you made a poor choice of covariance matrix for the fine-grid retrieval as the relative uncertainties tend to zero. I appreciate that the magnitude of elements in the covariance matrix should decrease with height, but I would expect the relative value to increase, especially considering your assertion that our knowledge of water vapour is lacking high in the atmosphere.

Fig.6 The x-scale of this diagram makes it impossible to judge the similarity between the lines at most heights. ± 200 should be fine, with an annotation to indicate the extreme outlier.

Gramatical suggestions:

P2L5 ‘their retrievals, with a much finer grid spacing than passive’

P3L7 ‘some foundational material’

P5L2 Perhaps ‘considered by’ rather than ‘included in’,

(4) The first S is italicised.

P7L1 ‘the fact that the uncertainties of OEM describe a different thing.’ Error and uncertainty are different concepts; you're talking about the latter.

P7L8 ‘same as the number of retrieval levels.’

P7L16 ‘kernel contains information regarding’

Tab.1 ‘The second column are the elements’

Fig.2 'freedom for the retrieval are 8.2'

P12L15 'through the mixing ratio formulae of Hyland and Wexler (1983).'

P15L1 I believe Poisson is capitalised as it refers to a Frenchman.

P24L3 'SNR of 2 and 10 km from the top of'

P28L8 Rayleigh should be capitalised.