

Interactive comment on “Fast retrievals of tropospheric carbonyl sulphide with IASI” by R. Anthony Vincent and Anu Dudhia

Anonymous Referee #2

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1 General Comments

This paper presents a year of global space-based measurements of OCS using a sophisticated linear retrieval method. The paper is very well written and clear and the conclusions the authors draw are reasonable. This paper represents a valuable addition to the capability of satellite based sensors to resolve OCS. The method in this paper furthermore allows for faster retrievals than have been possible previously allowing for rapid analysis over long periods. The measurements of OCS they have managed to derive are impressive. They have put a lot of effort into characterising potential sources of systematic error related to the retrieval method and include a balanced discussion of the strengths and weaknesses of the approach and the expected impact on the results.

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2 Specific Comments

pg 2 | 5 Consider clarifying to indicate that the random error associated with the mean or median value can be improved by averaging.

pg 3 | 27 where you mention "manned space flight" would be good to mention the mission name.

pg 5 | 14 would say here that ϵ is the error in measured signal relative to the linearised forward model rather than just forward model.

fig 2 pg 8 are these two plots the different surface temperature contrast scenarios? Needs mentioning in the figure caption.

pg 12 | 5 Perhaps you mean "will show an associated spectral feature beyond the standard deviation" rather than "in the standard deviation" here?

pg 13 | 17 Perhaps the part about how you deal with spectral variations due to H₂O in the measurement error covariance could be illustrated by an equation? For the nomenclature, here do you really mean the "variances of the measurement covariance" or do you mean both the covariance and variance entries of that matrix. Where it states "measurement covariance", this strictly refers to $\langle yy^T \rangle$ i.e., the covariance of the measurement rather than the "measurement error covariance" $\langle \epsilon\epsilon^T \rangle$ although you don't always see them distinguished in the literature. Here do you strictly mean measurement error covariance?

pg 16 | 5 Here it's that are only 80 independent atmospheres that implies there should be colinearity in the overdetermined system in Eq 12 which means you expect to be able to reduce the dimensionality. Therefore perhaps reconsider the wording of the sentence "However, since there are only 80 independent atmospheres considered, the dimensionality of the problem must be reduced....".

pg 17 Found it somewhat difficult to follow which methods were being referred to in

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the discussion about the method to select the initial atmosphere. Perhaps you could specifically label the methods to help the reader follow more easily.

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