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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Technical Note: Regularization performances with the error consistency method in the case of retrieved atmospheric profiles" *by* S. Ceccherini et al.

Anonymous Referee #2

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General comment

This paper proves the advantages that can be achieved on real measurements by a regularization strategy that has been recently published by one of its authors. This strategy is applied to MIPAS measurements but the results are of general validity for similar atmospheric measurements. In my opinion the importance of the results and the overall quality of the presentation are such to deserve publication on ACP. However a few of substantial points need to be first clarified in the manuscript as indicated below.

Specific comments

P.2. l. 19: To my knowledge pressure profiles are not retrieved by ORM.

P. 6 second paragraph: The authors choose to apply sequentially a full Levenberg-Marquardt retrieval and then the regularization process. However the regularization process is usually included in the iteration steps. I understand that, for practica applications, the proposed solution needs lighter calculations but the authors should comment about the expected difference in the results.

P. 6 Eq. (12): The AKM of the final products is given as the product between the AKM of the two individual steps. This combination rule of the AKs is not straightforward and should be justified.

P. 7 discussion starting at l. 4: This discussion is misleading at least for a reader which is not familiar with the ORM applications. The statement "two runs of ORM" seem to indicate a MIPAS limb-sequence that has been analyzed twice with the two strategies. However, from the discussion that follows it seems that a single run refers to all sequences analyzed using, for each, the results of the previous sequence. If this is the case it should be clearly stated at the beginning of this discussion.

Technical corrections

P. 1. Introduction l. 1: I would prefer "to introduce a conditioning in" instead of "to improve the conditioning of".

P. 2. l. 2: I suggest to add "in the solution formula" after "implemented".

P. 2. l. 10: I suggest to add "in this paper" after "is made"

P.2. l. 19: I suggest "from a limb-sequence of MIPAS spectra"

P. 3. Sect. 2, l. 10: "of the measurements" should be eliminated.

P. 3. Sect. 2, l. 14: "first derivative": of which function wrt which variable?

P. 6. l. 1: It should be specified whether this statement is of general validity or is

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referred to MIPAS.

P. 6. l. 9: I suggest " to apply the two strategies" instead of "perform the two operations".

P. 6. last line: I would say "quantity" instead of "species" because pressure and temperature are not species.

P. 7. l. 3: "main retrieval target" instead of "VMR profile" for the same reason as previous point.

P. 8. l. 12-13: I would state first the "initial guess for the retrieved ones".

P. 8. l. 17 and below: I would separate the discussion on the number of iterations (that indicates thatĚĚ.finds more easily the minimumĚ.) from that on the values of the reduced chi-square that follows "Furthermore"

P. 9. l. 20: I suggest to substitute "and this interpretation" with "that".

P. 10 Conclusions l. 2: "real measurements" is used in this paper to indicate MIPAS spectra. I suggest to substitute "real measurements" with something like "atmospheric parameters derived from real observations". For the same reason, in the same line I would replace "used for the regularization of" with "applied to".

P. 10 period starting at l. 12 is hard to interpret. I would suggest something like: "In the analyzed measurements some tangent altitudes, and the corresponding retrieval grids, oversample the atmosphere with respect to the vertical IFOV. In these cases the presented retrieval procedureĚ.".

Table 1 caption: after "retrieval" I suggest to add " on 78 scans of orbit 17540"

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