

***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 #3

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Overview of Paper

In this paper the authors present an application of a regularization technique to real data collected by the MIPAS instrument. The regularization technique is one they have developed where the regularization parameter λ is chosen such that the differences between the regularized and non-regularized profiles are on average equal to the error on the regularized profile. This paper does not develop any of the theory, it simply focuses on a particular application to the MIPAS ozone data where the authors demonstrate through a short statistical comparison that their technique results in smoother retrieved profiles without significant compromise of the vertical resolution.

General Comments

I am not familiar with the MIPAS processing and as such it was difficult to follow some of the more technical aspects related to the ORM. The reader is left to speculate as to what is meant by many of the statements. As I will discuss in detail in the specific comments I feel a more detailed treatment of the MIPAS retrieval algorithm is required.

I am concerned with the statement the authors make at the end of the Results section. I am almost certain they say their technique, in the strictest sense, is not valid for use with the MIPAS data because it is only rigorously correct when the VCM S_x is diagonal. I hope I have mis-interpreted this. If I have, then their statement in the last paragraph needs to be more clearly written. However, if I have not mis-interpreted the statement the authors must do a much better job of justifying why they should apply their technique to the MIPAS data.

I would really like to see some justification to the post-processing regularization approach adopted by the authors. Why did they chose to do it this way? How does it compare to applying the regularization at each iteration?

I would really like to see a comparison of results when other values of the regularization parameter are used. The authors never state their method provides any advantages over other choices of λ .

Specific Comments

The discussion on line 16 regarding the regularization matrix, \mathbf{R} , makes no sense without a paragraph or two introduction to the MIPAS ORM.

A statement is required that clarifies exactly what is meant by the a-priori vector is chosen to be the null vector. In words, what does this mean to the mathematics?

Without any knowledge of the MIPAS retrievals I can only speculate as to what is meant on lines 21 through 27. This statement will be much more clear when the better description of the ORM is included in the paper.

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I am always skeptical of single profile results as it is the tendency of the authors to show their best effort. Figure 1 definitely shows the method smooths the profile where it is structured and leaves it alone where it is already smooth. However, it doesn't tell me how well it does this and whether or not any advantage was gained by the regularization. The structure may actually be real. I would really like to see the examples where the regularization took unstable retrievals and made them stable. These results would go much further in convincing me the method is applicable to MIPAS data.

Once again I am very concerned with the last paragraph of the Results section. The authors must clarify why they applied their technique to the MIPAS data when they say it is not applicable.

Interactive comment on Atmos. Chem. Phys. Discuss., 6, 13307, 2006.

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