

## ***Interactive comment on “Assimilation of atmospheric methane products in the MACC-II system: from SCIAMACHY to TANSO and IASI” by S. Massart et al.***

**Anonymous Referee #1**

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The manuscript discusses the assimilation of satellite derived methane products within the MACC-II greenhouse gas data assimilation system. Simulations without assimilation are compared to results when assimilating either of three satellite products: SCIAMACHY, TANSO and TANSO together with IASI. The results are evaluated with aircraft data from the HIPPO campaign and with column measurements from the TCCON network.

The motivation behind this study, i.e. assessing the impacts when switching to a different data product in the assimilation system, is justified and the topic itself of interest given that chemical data assimilation is still a fairly new field with many open questions.

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But the study as is focuses on technical aspects and includes little scientific value. As such I do not see it suited for a journal like ACP, but suggest it would be better suited for GMD. There are also a number of issues I think should be addressed before publication.

Major Comments:

#) The results demonstrate no clear improvement with the assimilation compared to the free run. Overall the free run actually seems to show the best performance. There are also large differences when assimilating the different products or different retrieval versions of the same product in case of TANSO. Yet the authors do not provide an analysis on the cause of these differences except for a general statement on possible biases in the different satellite products. Such a bias should anyways be addressed in advance of assimilating the products, specifically when jointly assimilating two products (TANSO+IASI). The results as shown give very little confidence in using any of the products for methane assimilation.

#) The observation error is taken from those reported in the data products, but for most satellite products these have been shown to not well represent the actual error established from product evaluations. Can the authors comment on this and have they tested the sensitivity of the results to these assumptions?

#) Can they authors provide estimates for biases and errors associated with the different satellite product from the evaluation with independent data? How do these depend on assumptions taken in the assimilation system (observation error, correlation length, background error covariance, etc.)? How do they compare to reported errors?

#) Does the evaluation with HIPPO and TCCON give consistent results? The information is hidden in the results, but should be brought out more clearly.

Other Comments:

#) More information on the details of the assimilation technique, error assumptions etc. are needed.

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#) Line 20, page 2560: what is the background error estimate based on?

#) Line 25, page 2574: shouldn't the assimilation diagnostics be checked to see if the data assimilation system makes proper use of the IASI data?

#) Line 19, page 2580: more discussion should be given on why IASI assimilation deteriorates the results.

#) Figure 9: The figure caption is not in line with the text in the manuscript and the figure itself.

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Interactive comment on Atmos. Chem. Phys. Discuss., 14, 2553, 2014.