

Interactive comment on “A novel gridding algorithm to create regional trace gas maps from satellite observations” by G. Kuhlmann et al.

Anonymous Referee #1

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The paper presents a new gridding algorithm for creating regional maps of trace gases distributions from satellite observations. Both simulations and real satellite data by the OMI instrument are used to assess the performance of the proposed method. Overall, the authors convincingly demonstrated that the new, parabolic spline method, is superior to the previous one, constant value method. The paper is rather well written. My comments are below.

MAIN COMMENTS

1) The problem of producing detailed maps is essentially two-dimensional. The missing part in the paper is insufficiently detailed description of the algorithm in 2D. In Section 2.4.4, the authors state that the surface spline can be computed uniquely using 1D

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splines with the reference on the paper by Kobza and Mlcak (1994). As this procedure is very important, a short description of the algorithm (in order to get the idea) would be very useful.

I found also unclear in the 1D descriptions, why the error term appears only in along-track formulation? (This seems to be not the case for 2D case).

An estimate of numerical efficiency for using 1D splines compared to 2D- spline method would be also useful in Section 2.4.4. This would justify the selection of the proposed method.

2) For any measurement, its uncertainty is nearly as important as the measurement itself. However, the uncertainty characterization for the data fields, which are created by the proposed method, is completely missing in the paper.

DETAILED COMMENTS

P.7873 l. 4 : “For a push broom scanner, we can neglect the x dependency” Please explain why.

P. 7873, l. 13: “Since the FWHM changes are small within a pixel. . .” According to Fig.3, this is not true for the nadir case.

P.7877, Eq.(13) Please provide direct expression for f'_i . (They seems to be differences, not derivatives, right?)

P.7885, l.15: “10% smaller” -> 10 times smaller?

P.7887, l. 24 “The reason is that the movement of the lattice between samples improves the parameterization of the distribution” This is true only for a constant source.

P.7888, 1st paragraph. It is worth to add a note at the end of the paragraph that uncertainties are included in the matrix B.

P.7894, l. 12 “high-resolution maps”. I think it is worth to mention here that the actual

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resolution is still limited due to the resolution of measurements. This is also related to the uncertainty/resolution characterization (see main comments).

SUGGESTIONS FOR FIGURE IMPROVEMENTS

Fig.3: Please add scale on the vertical axis.

Fig. 5: Please arrange subplots in a different way (e.g., 2 x 2) for better visibility. Pink line is practically invisible.

Figs.6 and 10: Yellow shading is overlapping with pink one and is invisible. Please use a more contrast color (grey, for example).

Interactive comment on Atmos. Meas. Tech. Discuss., 6, 7867, 2013.