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Atmospheric Measurement Techniques Discussions

Interactive comment on "Spatial resolution of tropical terrestrial CO_2 fluxes inferred using space-borne column CO_2 sampled in different earth orbits: the role of spatial error correlations" *by* P. I. Palmer et al.

Anonymous Referee #2

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This paper describes a series of observation system simulation experiments about the estimation of CO_2 surface fluxes from space-borne measurements of CO_2 mixing ratios. The results are not surprising but the study nicely exposes this technical subject and therefore brings an interesting contribution to the scientific community. I recommend its publication in ACP provided the following points are clarified or corrected.

- p. 3152, l. 14-19.

  The first sentence ("For a specified spatial resolution...") tells of a "disproportionately small decrease in flux uncertainty". I understand that this should read "disproportionately large decrease in flux uncertainty" or "disproportionately small flux uncertainty".

- Same page and lines.

  'Confirm' would be more appropriate than 'find' in both sentences since this result is expected, i.e. different findings would mean that the study is flawed. See, e.g., Chevallier (2007), Geophys. Res. Lett., 34, L24804.

- Same page and lines.

  Those two sentences seem to refer to the results mentioned on p. 3261, l. 16-18 only. The importance given to these 3 lines by reformulating them in 5 lines of the abstract is too large.

- p. 3154, l. 12-14.

  The first two points of this review apply here as well.

- p. 3258, l. 8.

  The temporal window on which n is computed should be given.

- p. 3258, l. 10-11.

  I cannot trust that the "results are largely insensitive to the value we adopt."

- p. 3258, l. 12-13.

  Assigning a standard deviation of 2.0 and 1.5 ppm to characterize the ability of a model to simulate the CO_2 column contradicts actual model-data comparisons. See, e.g., Reuter et al. (2011), J. Geophys. Res., 116, D04301, doi:10.1029/2010JD015047.

- p. 3258, l. 17-18.

  Model error should not dominate the observation error budget, at least for single sounding statistics. The situation may be less favorable for the model when looking at temporal or spatial averages of the observations.

- p. 3258, l. 21-22.

  The temporal window at which the spatial correlation applies should be given (day, orbit, month?).

- p. 3259, l. 28.

  The fact that random errors are well below 1 ppm means that OCO-2 measurements will be better than current TCCON data. See, e.g., Wunch, et al. (2011), Phil. Trans. R. Soc. A, 369, 2087-2112. This is not realistic.

- p. 3260, l. 12-14.

  The explanation given in the sentence starting with “we find” is obscure to me.

- p. 3261, l. 8.

  “Less” would be more appropriate than “not significantly”. At the 0.5 level, the prior still plays a large role.

- p. 3261, 21-22.

  The authors acknowledge a pending issue about spatial error correlations without addressing it. This is surprising given the topic of the paper.

- p. 3263, l. 3-4.

  Atmospheric mixing will likely prevent inferring some diurnal cycle of the surface fluxes from that of the column.

Interactive comment on Atmos. Meas. Tech. Discuss., 4, 3251, 2011.