

## ***Interactive comment on “What can tracer observations in the continental boundary layer tell us about surface-atmosphere fluxes?” by C. Gerbig et al.***

**C. Gerbig et al.**

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We appreciate the positive general comments made by the reviewer. In the following is a reply to the minor comments:

L17-20 p 9251 : This is true of the North American continent but also in Europe. It is to be noted that CO<sub>2</sub> measured at eddy flux towers is useful if calibration enables meaningful intercomparison of the towers.

Response: Indeed, we specifically mentioned “...observations of CO<sub>2</sub> ... with sufficient accuracy”, which of course means that they are on the same scale and comparable.

L14 p 9259 : The parenthesis “(also with 100 particles)” is not understood ?

Response: This is a mistake; it should instead read “(also with 4000 particles)”. This has been corrected in the revised manuscript.

p 9266 : Could there be a discussion of how much the “cross-talk” that is seen is dependent on the set up used and if possible how it can be reduced ?

Response: In the final version we have added the sentences:

The “cross talk” is principally not avoidable; it is related to the fact that the measured CO<sub>2</sub> signal does not contain the full information about the different sensitivities at the different locations. The magnitude of the “cross-talk” depends on the a priori knowledge: If the a priori knowledge about respiration fluxes (i.e. temperature sensitivity) would be comparable to that about uptake fluxes (light sensitivity), there would be less “cross-talk” from light to temperature sensitivity, but more “cross-talk” in the other direction.

L20 p 9266 : The verb “is” is missing.

Response: This has been corrected in the revised manuscript.

L1 p9268 : There is probably a typo after the “if”

Response: This has been corrected in the revised manuscript.

First paragraph p 9268 : I think the comparison between an accuracy of 0.14-2.8Mt C/year and the 1 GtC/year of Gurney et al. is not quite fare. In the first case the numbers are from a pseudo experiment. These numbers are probably too low in the context of real world application and might be slightly misleading.

Response: We have added the following disclaimer in the text:

Although in this pseudo experiment we have paid attention to using appropriate magnitudes for the various error terms, there is certainly additional uncertainty in the rep-

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resentation of biospheric fluxes with simple temperature and light sensitivities, also vertical transport remains uncertain, with potential biases. Further, the assumption of a covariance matrix with an exponentially decaying spatial correlation might not be appropriate. However, we don't feel that there is room for more than an order of magnitude in the posterior uncertainty. Given the 2-3 orders of magnitude larger uncertainties from coarse global inversions, this clearly shows the potential of high resolution transport modelling coupled to diagnostic biosphere modelling, and using continuous records to solve for parameters in the biospheric model. Of course this potential has yet to be realized in the future by fully coupling the regional to the global scales.

Legend Fig 3 : The construction of the third sentence is awkward.

Response: The sentence "Note that the y-axis is not linear in area." has been replaced with "Note that the square root of the grid area is plotted as the y-axis." in the revised manuscript.

Legend Fig 9 : No vertical arrows are seen on the plot ?

Response: Indeed, the arrows have not printed in processing. Since they contain redundant information, we have decided to skip the sentence referring to the arrows in the legend of the revised manuscript.

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Interactive comment on Atmos. Chem. Phys. Discuss., 5, 9249, 2005.

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