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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Variability and budget of CO_2 in Europe: analysis of the CAATER airborne campaigns – Part 2: Comparison of CO_2 vertical variability and fluxes from observations and a modeling framework" *by* I. Xueref-Remy et al.

Anonymous Referee #1

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Overview

This paper by Xueref-Remy et al represents an important contribution towards understanding the regional emissions of CO2 in a heavily populated region. The point of the work is to improve our ability to quantify regional fluxes of CO2. The study tests transport modelling against vertical profiles obtained during flight campaigns, and also against 222Rn data. The results are interesting in their own right, and important for design of future attempts to verify emissions declarations. Moreover, they show us how far we remain from a proper top-down quantification of fluxes.

Specific Questions p 4276-8: Model prescribed surface fluxes for LMDZt - is it valid to use annual fossil fuel emissions? How are these quantified by season and by time of day (e.g. rush hours). Is there an emission cycle prescribed in the fossil fuel fluxes? These will be highly variable with daily/hourly urban conditions and weather, with a strong diurnal cycle of emission. In winds reaching the campaign sites, the previous period's fossil fuel emissions from upwind Europe may be observed above the ABL. This may affect the interpretation of the biospheric uptake in Fig 5. p4282-3. Boundary layer implications are very interesting and show the power of this approach. This is a strong argument for more aircraft campaigns. p 4284 - maybe I've missed the detail, but are local Rn data used, from Geological Survey information? Rn emissions are very variable (not uniform!) and it would help if the Rn emission discussion gave some more geological information here.

Figure Captions The captions are not always clear - it took a while to decide which was model and which was observed in fig 1 onwards. Many captions are too compressed and do not read easily - very hard work. It would be nice to have a regional map, especially for non-European readers.

Typos: Various minor errors of English:for example p4273 negligEable Fig 9 capt - aricraft.

Conclusion I strongly recommend publication, after revision to address the points raised, especially the diagram captions. This is an important paper that tackles a hard problem. It is valuable and may contribute much to the solution of the difficult task of verification of fossil fuel emission declarations.

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 4271, 2010.