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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Source-receptor relationships for airborne measurements of CO_2, CO and O_3 above Siberia: a cluster-based approach" *by* J.-D. Paris et al.

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Unfortunately, the second reviewer even after several positive confirmations did not furnish his assessment of the manuscript. This caused the excessive delay; I apologize to the authors for this.

After rereading the manuscript, the first review and the authors response, I accept the manuscript for ACP subject to the implementation of the revisions requested by the first reviewer. I myself have also a few comments given below that should be addressed in producing the final manuscript version for ACP.

Introduction

Even though the thrust of the paper is on illustrating the clustering method, there are also in situ data from Eurasia - in particular data from the TROICA campaigns on the Transsiberian railroad (e.g. Oberlander et al. JGR, 2002). Unfortunately, results of the later TROICA campaigns have only been published in the gray literature; but there is e.g. TROICA 11 which took place exactly during the time of YAK-3 observing CO2, CO and O3 along a surface transect from Moscow to Vladivostok and back. It would be nice to at least mention TROICA in this paper; it might be interesting to compare in a future study the surface measurements with the YAK measurements along the west-east direction. There is also the ZOTTO site at 60N, 90E, where all gases are continuously measured (e.g. Kozlova et al., GBC, 2008)

Section 2.1.

Please mention the time of day of the flights; this is important especially for CO2 which has a strong diurnal cycle in the PBL in summer.

Section 2.2.

Backtrajectories are computed every 10hPa (or 100m) change in altitude along the aircraft track. Is this justified given that the parent meteorology from ECMWF does not have such a fine vertical resolution in most part of the troposphere? Backtrajectories are calculated for 10 days - what is the scientific rationale behind this limit - why not 15 or 20 days or only 5 or 8 days?

Section 3.1.

The description of the CO2 vertical profiles is written as if no other in situ measurements exist in the are. However, there is an extensive Japanese aircraft measurement program with vertical profile flights over western Siberia (not sure where it has been published, though), and there are PBL measurements from the ZOTTO tower from 2006 and 2007 (Kozlova et al., GBC, 2008). At least the latter could be referred to. Interestingly, the April 2006 data from ZOTTO are around 390ppm confirming the FI

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1 flight data, however, in September 2006 the ZOTTO tower recorded CO2 values of 380-385ppm, which is higher than the values shown in Figure 4 (Fl 5).

Section 4.2, 4.3

The findings reported here with respect to the fire emissions are difficult to understand. What does the empirical negative correlation between CO and CO2 really imply? There exist a lot of studies in the literature reporting on CO/CO2 emission ratios from various types of fires. Clearly, these are not appropriate here, as the approach somehow integrates over large areas. Only the CO signal has some fire signature, while the CO2 signal is confounded by biospheric uptake in the vegetation elsewhere. Thus the regression values between these tracer found here must be very specific to the setup of the calculation and has no universal implications. I'd revise these sections and possibly remove Figure 12.

Section 5.

The found correlations are nice, but it would greatly help the non-specialist reader if the implications were a bit more clearly explained. What do the slopes of ppm sˆ-1 imply? What is the unit "gridˆ-1" - I presume 1 "grid" is a 1x1 lat-long area? A little bit more information of how the correlation numbers have to be interpreted would greatly help the impact of the paper. Are these numbers only specific to the setup of the calculation in this study?

Fig. 1:

The figure mentions the flights 1-8, but not the flights 9-12.

Fig 6 (and 8 and 10):

Add in the caption what is meant by the gray areas.

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 6207, 2009.