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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Carbon monoxide observations from ground stations in France and Europe and long trends in the free troposphere" *by* A. Chevalier et al.

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Thank you for your submission to ACP/ACPD and I am pleased to serve as the editor of your paper. As editor I have read through the text very carefully and have my own comments and recommendations in addition to those of the anonymous referees. Overall I find this analysis of CO above western Europe to be of general interest to the scientific community, however the calculation and interpretation of the CO trend at PDM requires further work before the paper is ready for publication. Please respond to my comments during your response to the anonymous referees. Best regards Owen Cooper, co-Editor ACPD/ACP

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Interactive Discussion

Discussion Paper

Change the title to: Carbon monoxide observations from ground stations in France and Europe and long term trends in the free troposphere

Abstract Change to: The variation with altitude of the mean CO mixing ratios from the surface sites is similar to the vertical variation of CO measured by the MOZAIC aircraft that fly in and out of Frankfurt.

Abstract Change to: Our study shows a recent change in CO trends over western Europe, with a smaller rate of decrease in CO mixing ratios since 2000.

Throughout the paper ppb needs to be changed to ppbv.

Introduction, page 3315, line 7 define what you mean by "local ozone formation"

Page 3320 line 24 It is an overstatement that MOZAIC aircraft fly "all over the world" because they do not cross the huge expanse of the Pacific Ocean, nor do they cross the Arctic or Antarctic. A more accurate statement would be that MOZAIC aircraft fly between Europe and destinations as far away as South America, western North America and eastern Asia.

Page 3324 line 2 change to: ....shows that the CO mixing ratios rapidly decrease with altitude in the first few hundred meters ....

In several places throughout the document you define an altitude above which the surface stations are representative of free tropospheric CO. This altitude threshold appears to vary according to the time period over which the data are averaged. For example: page 3324 line 6 page 3325 line 19 page 3326 line 6 page 3326 line 18 page 3327 line 1

Because the discussion is scattered throughout the paper it all becomes quite confusing. To help the reader keep all of this straight please state when this issue is first discussed that the threshold changes according to the averaging time period and then provide a table showing the altitude threshold for each averaging period (yearly, seasonally, monthly, summer vs.winter).

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Section 4.1 This section needs a lot of work, especially in terms of providing additional analysis of the PDM trends. Page 3328 line 19 you say that the decrease over 23 years is 13 ppb. But by my calculation, 133ppbv-117ppbv=16 ppbv. You state that the 13 ppbv decrease at PDM is well above the interannual variability at ZSP. But figure 10 shows that the change in CO at ZSP from 1997 to 1998 is greater than 13 ppbv. Therefore I am not convinced that interannual variability can be ruled out when explaining the change in CO at PDM from 1983 to 2005. As such the "definitive conclusion" statement on page 3328, line 24 is not justified, especially since you already state that the available data are not sufficient to provide a confidence interval on the trend. About all you can say is that the decrease in CO at PDM fits with the ZSP data and seems to support the idea that there is a decreasing trend in CO in western Europe.

Are the average values at PDM in Figure 10 annual averages or seasonal averages? I think these are annual averages. By limiting the analysis to annual averages the authors are ignoring valuable data from 2004 and 2006. For example the data can be broken down into seasons so that two summers and two winters of data at PDM from June 2004 though May 2006 can be analyzed. Actually PDM does have two full years of recent data, June 2004 – May 2005 and June 2005- May 2006, they just don’t happen to coincide with the traditional Jan-Dec definition of a year. How a year is defined should be irrelevant when comparing data that are 20 years apart, so long as each year covers 12 months. So an additional trend analysis should be conducted using two years of data from the 1980s and 2 years of data from 2004-2006. This will help to remove some of the uncertainty regarding interannual variability.

By the time you make these additional calculation several months would have elapsed from your first analysis. Are additional data from PDM during 2006 or 2007 now available to add to the analysis?

Page 3329 line 15 The negative trend at PDM was calculated to be -0.71 ppbv/year, but you round it to -1 ppbv/year. While this may be technically correct it can be misleading because the reader could estimate that the decrease in CO at PDM over 23 years is

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23 ppbv, when in fact it was only 16 ppbv. So to maintain accuracy replace -1 ppbv/yr with -0.71 ppbv/yr.

Figure 9 the y-axis has no label and the x-axis label in incorrect

Figure 13 this figure would be more useful as a scatter plot of CO vs fire pixels with lines fit through the data.

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 3313, 2008.