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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Analysis of the latitudinal variability of tropospheric ozone in the Arctic using the large number of aircraft and ozonesonde observations in early summer 2008" *by* Gerard Ancellet et al.

Gerard Ancellet et al.

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We thank reviewer 2 for his review. We apologize for the large number of English errors and the new manuscript has been carefully edited by one of the English speaking co-author. Find below the answers to the questions raised by the reviewer. See also attachment in the Reply to Reviewer 1 for the new revised manuscript.

Reviewer :"The paper provides a detailed description of tropospheric ozone measurements during the POLARCAT campaign in summer 2008, and a series of analysis of its variability and possible sources affecting the variability by using WRF-Chem chemistry-

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Discussion paper

transport model. The description is intensive and the analysis is generally sound, reaching some interesting conclusions. I found the paper be a nice piece of work contributing to better understanding of sources and processes affecting the summertime ozone at high-latitudes. The paper is well within the scope of ACP, and can eventually be published. However, I found some descriptions/illustrations are redundant. There are many errors in English. Some figures look preliminary. These made me difficult to follow what the authors are trying to tell us. So, I would suggest some technical suggestions that should be addressed before publication. Figures 5, 7, and 9: The same data are plotted in both linear and logarithmic scales. I doubt if the authors really need logarithmic plots, as they do not discuss much on the log plots. The log plots seem redundant to me."

The log plots have been removed as suggested by the reviewer because they are not specifically discussed in the text. We also agree with the reviewer that some plots needed improvement. The measured/modeled ozone scatterplot (Figure 5) has been changed to better distinguish tropospheric and stratospheric data (now in white) and to include the O3 concentration unit in the x-axis label. The back trajectory plots (Fig. 11 and 12) include now the name of the corresponding zone shown in Fig. 6 and 8 and unit for the altitude color scale. A new figure is created (Fig. 10) for the map of the MODIS aerosol optical depth and the MAP of the CFS fire counts distribution has been added to it

Reviewer : "There are many errors in English: L1: The goals of the paper are ... L7: Ozone, CO and . . . is too much detail in Abstract, and can be removed. L10: The average ozone concentrations are 65 ppbv ... L14: ... modeled CO ... L18: ... ozone gradient of -6 to -8 ppbv . . . P7, L17: MEGAN (Model of ...) Figure 2 caption: Intercomparison of ozone measurements ..."

We thank the reviewer for his help in the manuscript editing. The English-speaking co-authors have also corrected many grammar errors.

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Reviewer: "Captions in other figures: Measured O3 (ppbv), Modeled O3 (ppbv) - need units!"

Done in Fig. 5, 7, 9

Reviewer: "Figures 3 and 4: I would make difference plots between observation and model, to illustrate where in height and latitude the model is good or bad. This is not necessary but please consider."

We understand the reviewer remark but the measurement/model comparison does not focus on small scale differences. The goal of the comparison is to check that the main latitudinal and vertical gradients are well reproduced in the WRF-Chem simulations. This is why we do not wish to produce a detailed 2-D plot of the modeled/mesuared ozone differences which will show mainly model/measurement spatial/temporal mismatches. We believe that the differences can be better discussed using two different 2D ozone plots for the model and the data and the detailed statistical informations about model /measurement differences being provided in table 5 for each region selected for the vertical and latitudinal gradient analysis.

Interactive comment on Atmos. Chem. Phys. Discuss., doi:10.5194/acp-2016-422, 2016.

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