Atmos. Chem. Phys. Discuss., 12, C12946–C12947, 2013
www.atmos-chem-phys-discuss.net/12/C12946/2013/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Pollution transport towards the Arctic during summer 2008" *by* J. L. Thomas et al.

J. L. Thomas et al.

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We would like to thank the anonymous reviewer for the careful reading of the manuscript and helpful comments. In summary, we have re-written section 4 of the paper to clarify the comparison between the model and measurements. The specific responses are provided in the attached online supplement.

Please also note the supplement to this comment:
http://www.atmos-chem-phys-discuss.net/12/C12946/2013/acpd-12-C12946-2013-supplement.pdf

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 29705, 2012.

Response to Anonymous reviewer #2

COMMENT:
This paper describes applying the regional CTM WRF-Chem run with 35 x 35 km grid to assess transport of wild fire emissions from Canada and anthropogenic emissions from north east north America to central/south Greenland. Attention is also focused on production of ozone during this transport and assessing impact on the ozone burden in high northern latitudes. The second phase of the IPY POLARCAT experiment in June/July is targeted for study because of the availability of airborne measurements from 4 different platforms. A unique aspect of the airborne data set is that several of the flights near Greenland sampled distinct plumes that had been characterized ~ 5 days earlier much closer to sources. Fresh wild fire emissions were sampled by the NASA DC-8 on 4 flights over north central Canada, and two profiles from MOZAIC over Philadelphia provide ozone and CO profiles in airmasses heavily impacted by anthropogenic sources.

As noted by anonymous referee 1, applying a regional CTM to these questions is probably the most noteworthy aspect of this study. The authors point out that several previous studies using global CTMs had not found BB plumes to be dominant sources of ozone in the Arctic troposphere, including several recent studies that also used POLARCAT observations to assess CTM performance in the Arctic and sub-Arctic during summer 2008. They suggest that global CTM simulations may underestimate ozone production in both urban and BB plumes partly due to the large grid cells used in such models, and test how well the regional CTM simulates the transport and evolution of several individual plumes that were sampled both fresh and aged. Having established some confidence in the skill of WRF-Chem to properly simulate plumes, the impact of all boreal fires in June-July is estimated to have increased ozone in the POLARCAT study region by about 5% from 6-9 km, compared to an 18% increase over the 2-6 km range attributed (by the model) to ozone produced in pollution plumes from north American anthropogenic sources.

The study is well designed and mainly well presented. I think it should be published in ACP after attention to a couple of relatively major suggestions (and a longer list of editorial comments.
RESPONSE:
The authors thank the reviewer for the helpful review and the careful reading of the manuscript. Each individual comment is addressed in detail below.

COMMENT:
Referee 1 suggests that the authors consider refining the statistical approach used to assess the impact of plumes (section 5.1) and I think I largely agree with these comments.
RESPONSE:
We agree with this comment and have addressed this in our response to reviewer #1.

Fig. 1.

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Interactive Comment