

Interactive comment on “The influence of boreal biomass burning emissions on the distribution of tropospheric ozone over North America and the North Atlantic during 2010” by M. Parrington et al.

Anonymous Referee #3

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This paper describes a study of ozone levels and distribution over the North Atlantic and North America. Modelled ozone levels (using the GEOS-Chem model) have been compared with profiles from ozone sondes and two different sets of satellite measurements. The modelled ozone levels agreed satisfactorily with the observations. The accuracy of biomass burning emissions estimates was assessed, and subsequently downscaled. Next, the influence of biomass burning emissions on ozone levels was assessed.

Overall, the authors have performed a very thorough validation of their modelled ozone levels, using their model in a forward mode and its adjoint, and assessed the sensi-

C11776

tivity of their modelled ozone levels to boreal biomass burning emissions. This paper deserves publication, but the comments below should be addressed beforehand.

The paper, as it is written currently, reads more like a validation exercise than a study of the impact of biomass burning emissions on ozone levels. I am pleased that the authors have validated their model data so thoroughly, but the focus of the paper is lost. It needs emphasising earlier on in the paper.

There is little discussion of how uncertain the results are. When for example, ozone levels are said to have fallen by 2-3 ppbv, what is the accuracy of this value? Are the changes significant? For example, page 25127, line 9, ozone biases are less than 1 ppbv - are these changes within the "noise" of the data? The data shown in Figure 3 suggests that they are.

Abstract, line 2. Should this read "We analyse the *sensitivity of* the tropospheric ozone distribution over North America... "?

Page 21507, line 20. The text states north of 50°N, but the line in Fig 1a appears to be at 45°N.

Page 25108, lines 25-28. Why did the authors not simply aggregate the 5 km data directly to their model's grid? What do they mean by 'interpolate' here?

Page 25116, line 10, rephrase as "... tropospheric distributions (600- 400 hPa, approximately 4-6 km) averaged ...

line 14, rephrase to "... reported in Table 4 of Boxe et al. (2010), ..."

Lines 23-24 and Fig.7/8. I would like to see a little more discussion of why the modelled ozone data have the strong north-south gradient over North America, yet this feature is not seen in either the TES or IASI ozone data. The authors mention this feature in the text of the paper but do not propose any reasons for it.

Page 25123, line 9, and caption of Figure 10, emission units should be molecules cm-2

C11777

s-1. Ditto Page 25124, line 11.

Page 25127, lines 5, 8, and 15, and Page 25128, lines 25 and 27. Given all the uncertainties, can the authors really quote ozone level changes to 2 decimal places of accuracy? There are other places in the paper where 2 decimal points are used, and then just 1 decimal place is used elsewhere.

Page 25129, lines 22-23. A reference is needed for the Master Chemical Mechanism.

Figures: The numbers in the figure scales and the title text are small and hard to read.

Fig 2A, the triangles are hard to see - could they be coloured white and/or made slightly larger so they stand out more? I suggest making the coloured lines of the boxes thicker so they are easier to see (and not on top of each other).

Figure 9, (a) and (b) are missing from the figure.

Figure 10, The figure title uses molec/cm²/s but the text uses molec cm⁻² s⁻¹ - Change the figure title to use the second version of the units (with negative powers) to be consistent with the rest of the paper.

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C11778