Reply to Anonymous Referee #2

We thank the reviewer for the careful reading of the manuscript and helpful comments. We have revised the manuscript following the suggestion, as described below.

General Comments

The paper is well written, and the subject is of importance to understand the HCL, $PM_{2.5}$ and BBSOA concentrations in Mexico City, and in similar cities where biomass/garbage burning is important. The contribution of 3-30% to $PM_{2.5}$ concentrations is remarkably high, indicating the importance of this often neglected source. The comparison with observations of the MCMA-2006 field campaign shows an overall good agreement between model results and observations.

Specific comments

(1) The WRF-Chem model is used in this study, and it is stated that this model is developed by Li et al. As far as I know the original WRF-Chem model is developed by Georg Grell et al. Would it be more correct to state that a specific version of WRF-CHEM is developed by Li?

We agree with the reviewer's comment and have rewritten the description of the WRF-CHEM model used in the study in Section 2: "*In the present study, a specific version of the WRF-CHEM model (Grell et al., 2005) is used to evaluate the GB impacts. This version of the WRF-CHEM model is developed by Li et al. (2010; 2011a, b) at Molina Center for Energy and the Environment, with a new flexible gas phase chemical module which can be utilized in different chemical mechanisms, including CBIV, RADM2, and SAPRC.*"

(2) In addition, reference is made to Li 2011c, which is missing in the reference list.

The reference should be "*Li et al. (2010; 2011a, b)*". We have corrected it in the manuscript.

(3) The model has a lowest layer of 50 m. Does that mean that the observations are compared to the 50 m averaged modeled concentrations, and does that have an impact?

Yes, we have clarified in the Section 2: "*It is worthy to note that comparison of the surface observations with the 50-m averaged modeled concentrations in the model first layer indicates that the impact is negligible because the simulated boundary layer height is at least 100 m and the vertical exchange of pollutants in the boundary layer is very efficient*."

(4) Boundary conditions are taken from MOZART, I assume that MOZART has been run for the same episode?

Yes, we have used the MOZART output for the same episode. We have added a reference:

Emmons, L. K., Apel, E. C., Lamarque, J.-F., Hess, P. G., Avery, M., Blake, D., Brune, W., Campos, T., Crawford, J., DeCarlo, P. F., Hall, S., Heikes, B., Holloway, J., Jimenez, J. L., Knapp, D. J., Kok, G., Mena-Carrasco, M., Olson, J., O'Sullivan, D., Sachse, G., Walega, J., Weibring, P., Weinheimer, A., and Wiedinmyer, C.: Impact of Mexico City emissions on regional air quality from MOZART-4 simulations, Atmos. Chem. Phys., 10, 6195-6212, 2010.

(5) The figures seem to indicate that the BC for HCL and BBOA are near zero, and are ca. 20 $\mu g/m^3$ for PM2.5, is that correct?

Yes, we set the boundary conditions for HCl and BBOA to be zero and for $PM_{2.5}$ to be about 20 $\mu g\ m^{-3}$.

(6) It is stated that the uncertainty of the GB emissions is a factor of 2 or more, is there a reference for that?

Yes, we have added a reference:

Hodzic, A., Wiedinmyer, C., Salcedo, D., and Jimenez, J. L.: Impact of trash burning on air quality in Mexico City, Environ. Sci. Technol., 46(9), 4950–4957, 2012.

(7) The model runs most likely have a spin-up time, is that 1-2 days or so?

Yes, we have clarified in Section 2: "*For the first episode, the spin-up time of the WRF-CHEM model is one day.*"

(8) It would be useful to add some sentences under summary and conclusions about the impact of the factor 2 uncertainty in GB-emissions on the results found.

We have added sentences in the Section 4: "*Sensitivity studies have shown that if the present GB emissions are decreased by 50%, GB is not an important source of $PM_{2.5}$ in Mexico City, contributing about 1-14% simulated $PM_{2.5}$ mass on average, and the WRF-CHEM model substantially underestimates the observed particulate chloride. If the present GB emissions are doubled in the WRF-CHEM simulations, the contribution of GB to the simulated $PM_{2.5}$ mass is about 6-60% and GB becomes a dominant source of $PM_{2.5}$ in some areas of Mexico City. The simulated particulate chloride is much higher than the observations.*"

Technical corrections

(1) Figure 2b states it shows the diurnal cycle. I assume this is the 5 day averaged diurnal cycle? (Page 13674, line 13)

Yes, it is the 6-day averaged diurnal cycle.

(2) Page 13677, line 6 should be Fig 5b, not 4 b, and line 14 it should be 5c, and not 4c.

We have corrected these typos.