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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Comparisons of WRF/Chem simulations in Mexico City with ground-based RAMA measurements during the MILAGRO-2006 period" *by* Y. Zhang et al.

Y. Zhang et al.

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Response to Reviewer #3:

We greatly appreciate the reviewer's thoughtful suggestions for improving the manuscript. Here are our point-to-point responses to the reviewer's comments.

1. Pg. 1339 lines 8-9. ... Time series of surface wind speed at monitoring stations (not shown) indicate that the model captures well the diurnal cycle of the observations ...

This statement is quite important, and it needs to be elaborated in more detail. Previous papers on Mexico City and elsewhere had reported troubles getting the right time of shifting of the MET variables on the diurnal cycle.

Response: We agree. In the revised version, we included a scatter plot between the observed and WRF/Chem simulated surface wind speeds and the diurnal cycle averaged hourly over all the monitoring stations during MILAGRO. We also checked the time series of surface wind speeds at individual stations and we noted that the model simulations match the observations quite well in terms of diurnal cycle.

2. Pg. 1340 lines 22-24. ... Uncertainties in emissions rates of NO and NO2 and deficiencies in model chemistry parameterization (e.g., conversion between NO and NO2) may be responsible for these model biases ...

There are many reasons for that behavior. One could be a lesser reactive simulated atmosphere than the real one. After photochemistry is switched off, N-containing compounding may form faster than the model does (i.e., to produce PANs, Organic nitrates, etc.). I consider convenient for the paper to include a discussion on how other key reactive species behaves against measurements, such as formaldehyde, Ox, etc. Those are available at different sites during MILAGRO field study.

Response: We quite agree with the reviewer and we feel that this is one of the major issues that need to be addressed when evaluating dynamic/chemistry model simulations. We have downloaded some HCHO measurements at T0 from the NCAR MILAGRO Data Portal but we are a little concerned about using the data for model validations because of quality issues. We have asked around for quality controlled measurement data for key reactive species during MILAGRO and we would like to put together a short report on this once we obtain enough data.

This is a very good point so we added the statement that the model may simulate less reactive atmosphere than the real world in the revised version.

3. Pg. 1342 lines 11-12. ... Table 1 also shows that the mean values of major pollutants (CO, NO, NO2 and NOx) decrease from weekday to weekend both in observations and in simulations as expected ...

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A dispute on this issue rises recently in the Mexico City Metropolitan Area (MCMA). The environmental authority claims that O3 levels increase at weekends, particularly on Saturday. Under this assumption, the No Circula Program was extended to include Saturday also. According to your table 1, not big differences in observed O3 levels were found on weekends. I think expanding a little more this discussion will increase the papers results.

Response: For O3, Table 1 shows a slight increase from weekday (31.9 ppbv) to weekend (32.3 ppbv) in the observed means and the increased value is within the uncertainty of measurement (3% according to Molina and Molina (2002)). At individual stations (I have the table but the table did not appear nicely here so I did not include it), the observed O3 shows increases from weekday to weekend mainly at the central and northern part of the MCMA with decreases elsewhere. This discussion was included in the revised version.

4. Pg 1331 lines 12-14. ... from approximately 4 million vehicles (burning over 40 million liters of fuel per day) and the emissions from ...

This statement is not correct. According to the latest Emission Inventory (2006) for the MCMA, the fuel consumption in this region is 47 million liters/day. This amount considers all fuels: gasoline, diesel for industrial and transport sectors, natural and LPG gas. The energetic content for all fuels is then converted into liters/day.

The Emissions Inventory 2006 for the MCMA has been improved substantially. Now it includes hourly emissions per pollutant, per day of the week, per season of the year, and it is spatially disaggregated. You can download it from the next link: http://www.sma.df.gob.mx/sma/index.php?opcion=26&id=501 It could be good for the authors to include this information as a reference and to re-write the emissions inventory section accordingly.

Response: Thanks for pointing out this and for the link to download the improved Emissions Inventory. This information is included in the discussion section.

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Specific suggestions and changes. 1. Pg 1333 lines 13-14. ... The dynamic cores in WRF include a fully mass and scalar-conserving flux form mass coordinate version that is widely used in air quality ...

The sentence is not clear.

Response: We agree. The sentence is re-written in the revised version.

2. Pg 1335 lines 2-3 ... The emissions inventory used in this study was gridded based on the official, bottomup emissions inventory for the MCMA for the year 2004 ...

Now is available the 2006 emissions inventory for the MCMA. See above.

Response: We used the emissions inventory that was gridded and compiled by the Molina Center for Energy and the Environment (MCE2) based on the official emissions inventory for 2004. We learned that work is under way at MCE2 to update their gridded emissions inventory using the official, latest emissions inventory. We would expect to use their updated emissions inventory in future work.

3. Pg 1336 lines 6-7 ... Four meteorological variables, temperature, relative humidity, wind direction, and wind speed were measured at 10 stations ...

The RAMA network has available 15 met stations, why to use only ten?

Response: It is correct that the RAMA network has available 15 met stations. We have the measurement data from all the 15 met stations; however, some of the stations report too many missing values for meteorological variables during the MILAGRO period that we decided not to use the measurement data from these stations. Our criteria is that if a station reports equal to or more than 20% of missing values during the MILAGRO period then we do not use this station for analysis. This is also true for chemical species.

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 1329, 2009.

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Interactive Comment