Review Comments: Impact of model resolution on chemical ozone formation in Mexico City: Application of the WRF-Chem Model, Xie et al.

This paper describes results from WRF-Chem simulations using 24 km, 12 km, 6 km and 3 km grid sizes for Mexico City. The results are interpreted in terms of the relative importance of higher resolution grids related to three key issues: 1 ) meteorological transport, 2) emission heterogeneity, and 3) ozone photochemistry. The primary conclusion is that 6 km is an optimal grid size for Mexico City that balances model performance vs computer resources. The paper also suggests that the ratio of urban dimension to grid size might be used as an indicator for the required grid resolution. This is a valuable result (although it isn't included in the abstract) since it provides a concept that generalizes the results of the paper and that could be tested in other urban settings. The paper should be published since there is interest and concern about grid resolutions to use for model applications and this paper provides some useful information and methods for investigation of this question. However, the paper requires revision in several ways prior to final publication. First, the relative effects of the three key issues were assessed in terms of model performance, but the model performance was only judged in a semi-quantitative way. Table 1 (which is isn't needed) should be replaced with a comprehensive table of model performance measures for each of the individual model runs and this should include measures of model bias and absolute error for both meteorological performance and chemical species performance. Performance for peak concentrations should also be included. Given these performance measures, it might be interesting to graph a performance measure vs grid resolution to help visualize the effects of grid size.

The real key to success with this type of paper is the development of a generalization concept that others might use in different settings. In this regard, the ratio of urban size to grid size is a useful starting place. The authors might also consider measures of the intrinsic variability of urban properties as a yardstick for required grid resolution. For example, how does the variability in emission density or population compare to grid size. If population is relatively uniform over large areas, then we might assume that emission inventories do not need to be developed at high resolution. Is this correct? What about variability in terrain height and how does that relate to meteorology? Are there differences in the variability for different ozone precursors and how does this relate to the photochemical effects investigated in the paper?

Beyond these larger issues, there are numerous editorial revisions needed. For example, the title should have a colon instead of a semi-colon. The various maps should be rescaled to show urban Mexico City in more detail and not the whole model domain since much of the domain is blank. The caption for Figure 1 is somewhat confusing and may include some mis-wording. There are no units indicated in Figure 2. In Figure 11, the ozone results need to be indicated for day and night.