Atmos. Chem. Phys. Discuss., 10, C4110–C4112, 2010
www.atmos-chem-phys-discuss.net/10/C4110/2010/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Impact of model resolution on chemical ozone formation in Mexico City; application of the WRF-Chem model" *by* X. Tie et al.

Anonymous Referee #2

Received and published: 17 June 2010

General comments

This manuscript examines the effect of model horizontal resolution on calculated distribution of O3, CO and NOx, through its influence on simulated meteorological fields and transport, emissions and nonlinear photochemistry, in the MCMA using WRF-chem, and examines the effect of each factor on pollutant simulation. This is a very interesting topic in chemical transport modeling that has not been addressed in-depth before. This paper attempts to tackle this topic in a systematic way. However, the quality of this paper would notch up a level if (1) the grid resolution design (table 2) is improved, and (2) the simulation extends to include more days or episodes.

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Specific comments

1) The resolution scheme in Tab 2 appears to be quite simplistic. In my opinion, the 24 km resolution can be ignored, since in such a case the MCMA urban area, where most RAMA stations for comparison reside, contain only 4-5 pixels, which is not suitable for simulating urban pollutants. Instead I would suggest adding more resolution combinations so that more rigorous explorations can be made of the effect of the three factors induced by the model resolution on the chemical performance.

2) The results are based on one-day simulations. To make the conclusion general and representative, multi-day or multi- episode simulations are needed.

3) It is not clear to me whether there is an objective standard in defining the threshold and optimal resolutions. For example, according to Fig 11, the 6-km resolution case yields the best overall performance (considering O3, CO and NOx together); but for O3 alone the 12-km resolution case has the best performance. This leads to the classic question–does model get the right result for the right reason? This suggests that it needs to be cautious when coming to define the threshold and optimal resolutions.

4) Including a table for chemical performance statistics would be helpful in defining the resolutions raised in the previous comment.

5) It would be valuable to include a table of meteorological performance and how does it translate into chemical performance in the cross-resolution examinations (like Run#4 and 5 in Tab 2). I would anticipate that it assists to answer the classic question in Comment #3.

6) The paper examines the optimal resolution toward the coarse end; an equally important question is toward the opposite end. Can authors add discussions on how the model performance would change if the resolution gets higher, and discuss whether there would be an optimal resolution toward the fine end (like 1km or higher)?

Technical

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10, C4110–C4112, 2010

Some languages need to be furnished.

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 9801, 2010.