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Atmospheric Chemistry and Physics Discussions

Interactive comment on "The role of horizontal model resolution in assessing the transport of CO in a middle latitude cyclone using WRF-Chem" *by* C. A. Klich and H. E. Fuelberg

Anonymous Referee #2

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An accurate simulation of vertical transport of atmospheric constituents remains challenging for the regional and global chemistry transport models. This study is focused on the impact of the model resolution on vertical transport of CO tracer. The authors have used the state of the art coupled meteorology chemistry model WRF-CHEM to simulate 3D distribution of chemical tracers in the atmosphere. As a case study a middle latitude cyclone in East Asia was selected. The manuscript is well written, the figures are very clear. I have a few comments, primarily on the WRF-CHEM model settings. I think these questions should be addressed in the manuscript before publishing it. - The authors have used a full gas chemistry (RACM) and simple aerosol parameterizations

(GOCART) to simulate a case study with a deep convection. However only the results for CO species have been presented. What was the purpose of doing a full chemistry? Why you didn't use a passive tracer option available in WRF-CHEM? - Is there any advantage of simulating aerosols? Did the aerosols feedback on meteorology and/or photolysis in the model? - The simulated concentrations of CO (consequently fluxes) will be affected by chemical loss and production. I suggest the authors to conduct simulations with the same model configurations, but gas chemistry turned off. Perhaps the numbers won't change drastically, however such a simulation will allow to interpret the simulation results of CO for different resolutions based solely on transport. - Also you report that the calculated fluxes between the D1 and D2 domains are very similar. In Section 2.2 you say that 2-way nesting between those domains was used. Did you present the results for the 2-way nesting runs? If so, the difference between CO concentrations from those domains over the same area will be small anyway.

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 14871, 2013.