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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Quantifying pollution inflow and outflow over East Asia through coupling regional and global models" *by* M. Lin et al.

Anonymous Referee #2

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General comments:

The authors use two high-resolution regional models (WRF-Chem and WRF-CMAQ) and one global model (MOZART-2) to examine the pollution outflow (to the western Pacific) and inflow (from Europe) over East Asia. The results emphasize the capability of regional models (in contrast with the MOZART global model) to capture the pollution outflow episodes in the upper troposphere, as observed during the TRACE-P aircraft campaign. The authors attribute it to the global model's inability to capture deep convection along the leading edge of the cold fronts as well as the coarse resolution. The results are original and well presented. This reviewer recommends publication after

some minor revisions.

Co-author G.R. Carmichael's group used the STEM regional model to provide chemical forecast during the TRACE-P field campaign and also to conduct post-mission analysis (Carmichael et al. 2003). Was the STEM model able to capture the deep convection events discussed in this paper? This should be discussed in the text, especially in terms of convective parameterization vs. model resolution.

Specific comments:

Title – This paper did not address pollution inflow/outflow over East Asia in the seasons other than spring (March). Please clarify this in the title. On the other hand, how about replacing "through coupling" by "with"?

Abstract – "Episodic outflow of CO,. . ..is twice as great in the WRF-Chem model . . ..". Not sure where this was mentioned in the text or Summary/Conclusions. Line 1, Page 121 – How large are "the striking discrepancies in the episodic outflow in the upper troposphere"?

Abstract – P111, L2: please clarify "compensating effects".

P112, L9: reference Stohl et al., 2007 is missing from the list.

P116, L24: It is worth mentioning specifically which convective parameterization(s) is (are) used in the driving meteorology of MOZART. As the authors pointed out, convective parameterization may play an important role in the (regional vs. global) model skill differences.

P120, L14-16: say a few words here explaining why you are showing total zonal fluxes at the 4-8.5km altitude range (vs. 2-4km).

P121, L8-9: "Calculated total zonal fluxes of CO are approximately 50% higher in WRF-Chem than in MOZART for the two episodes." - It appears that Figure 2 (4-8.5km) does not show this large difference. How about the zonal fluxes of CO at 0-4km?

P121, L27: Wuhang or Wuhan?

P123, L16: It is inappropriate to cite here Duncan et al. 2003, which is about the impact of the Indonesian fire emissions. In the context of the present study, Southeast Asia biomass burning includes mainly those fire activities over continental SE Asia (Indochina) and the Indian subcontinent, instead of those over the maritime continent (Indonesia). They occur in different seasons of the year.

P123, L25-27: consider citing this paper: Lin, C.-Y., et al., A new transport mechanism of biomass burning from Indochina as identified by modeling studies, ACP, 9, 7901-7911, 2009.

P128, section 4.1: How was the European region defined (latitude/longitude ranges)?

Reference: Guenther A. et al., 1994 is misplaced in the list.

Fig.1: the legends are too small to read, at least in the printer friendly version.

Fig. 5: please indicate the latitudes/longitudes of the flight track.

Fig. 7 caption: The sentence "Note that ...." needs a reference – is the linearity valid?

Fig. S5: remove "NO2 (middle panel)".

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 109, 2010.