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Geoscientific Model Development Discussions
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Interactive comment on "A database and tool for boundary conditions for regional air quality modeling: description and evaluation" *by* B. H. Henderson et al.

Anonymous Referee #1

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The manuscript by Henderson et al. described a database and tool that can be used to generate dynamic boundary conditions for regional air quality modeling specifically for the contiguous U.S. domain. Some evaluation results have also been presented and discussed. Accurate lateral boundary conditions (LBCs) have always been important for regional modeling studies, since they represent the long-range intercontinental transport that typically cannot be simulated by the regional model itself. Although the sources of data and tool are missing from the paper (I would assume that they will eventually be publically available), the work here will greatly help the scientific community to build representative LBCs for their regional modeling studies. However in the current manuscript, only one species (i.e. ozone) has been evaluated against one set

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of satellite retrieval (i.e. TES). I feel that the authors need to provide more robust and comprehensive evaluations (such as more species and satellite retrievals; see the specific comment below) of the database in order to convince the community that LBCs from this database and tool are valuable enough.

Specific comments:

On page 4666, line 8: for "public database", is the database already available to public? If so, could you provide the link? If not, I would suggest to remove "public".

On page 4669, line 1-2: I didn't see any discussions on the availability of the database and tool.

On page 4670, paragraph 1: should provide some background information about different versions of GEOS-Chem/chemistry version and explicitly mention that the chemistry version is not the same as the GEOS-Chem version, since readers might be confused by those version numbers such as v8-02-01, v8-02-03, and v8-02-04; line 18-20: note 3 can't be found; what's the NEI version?; Is Asia emission based on TRACE-P or INTEX-B?; paragraph 3, line 27-29: This paragraph is very hard to follow and need to be revised. There are 5 sets of simulations listed in Table 1, but only two simulations were mentioned. The simulation years are not consistent between the text and Table 1. It mentioned that "prior to 2004, GEOS-Chem requires use of version 9". Why for an older episode, it requires even the newer version of the model?

On page 4674, line 16-17: is this chemical species output file the same as the "cspec" file?

On page 4675, section 4: I would suggest additional evaluations by using more satellite retrievals such as ozone from OMI and CO from MOPITT to provide a robust assessment of the database. CO has been recognized as a key tracer species by many global models to represent the capability of those models in accurately simulating the intercontinental transport. So the evaluation of CO profiles or columns seems to be

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essential. There are also high uncertainties among different satellite retrievals and the conclusion might be situational when comparing simulations with different observations. Evaluation against another set of retrieval such as ozone from OMI would help to address such a concern.

On page 4676, line 8: two years, 2006 and 2008, need to provide the justification for choosing those years out of 10 years for the model evaluation? Also should they be three years, 2006-2008?; line 16: how is the averaging kernel determined from TES retrieval? Need to provide such information here.

On page 4677, the first paragraph: It is not very clear to me whether all the plots including those in the Appendix for north and south perimeters are with the bisected allocation of west/east perimeter? The justification to combine north and south with west and east based on differences of simulation and satellite retrieval is not convincing to me. The intercontinental transport into the U.S. is dominant by the Asian pollutants through the Pacific and is more evident along the western and northern boundary of the U.S. The evaluation for those two boundaries might be more of scientific interests to the users. I would suggest adding the results of western and eastern perimeters into Figure 1.

On page 4678, line 13: why are only Southeast Asia emissions? How about the East Asia? May need a reference for this statement; line 15-16: The conclusion is not so convincing based on the limited model evaluation in the current version of manuscript and the issue can be addressed based on the aforementioned suggestion.

On page 4680, the first paragraph: I believe CMAQ uses 10% and 90% splitting factors for POC emissions into Aitken and accumulation mode.

Technical corrections:

On page 4666, line 25-26: have been tightened.

On page 4667, line 7: AQMs.

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On page 4668, line 1: ranging from; line 27: outputs.

On page 4669, line 12-13: remove "." before "(Details"; move "." after "chem/" out of parenthesis.

On page 4671, line 21: pre-processor.

On page 4672, line 7: Fig. 2 is a black-white one and need to change "in green" to something else.

On page 4673, line 17: Lines 4-8 should be lines 4-9? Line numbers in the next paragraph seem to be messed up as well.

On page 4674, line 22: delete "the".

On page 4675, line 17: delete "previously".

On page 4676, line 16 and 19: "a prior" and "the prior" should be revised as "the a prior". Please revise the similar typos throughout the manuscript.

On page 4677, line 2: the most; line 18: details; line 27: as shown.

On page 4678, line 14: suspected.

On page 4690, Table A1: N2O5, N2O5 should be subscripted and please correct others in all the tables.

On page 4691, Table A2: in the form of; BUTADIENE13, something is missing here?

On page 4695, Fig. 3.: and simulated by GEOS-Chem. Same changes for other figures.

Interactive comment on Geosci. Model Dev. Discuss., 6, 4665, 2013.