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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 #2

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Henderson et al. present a, much needed, database and a tool to create boundary conditions for use in regional air quality models. Although the manuscript focuses its applicability to CMAQ, it should be useful to researchers and regulators all over the world in using the tool for their regional air quality model of choice. I would recommend publication of this manuscript after the authors have addressed my comments.

Major comments:

1. As the other reviewer has pointed out, the authors have only evaluated the LBC for ozone against a specific database of satellite retrievals. To my knowledge, there are there are two satellite datasets that could be used to evaluate the LBC in addition

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to the comments of the other reviewer: NO2 retrievals using the OMI , PM2.5 and dust retrievals using MODIS . For species that cannot be evaluated, it might be helpful to qualitatively compare GEOS-Chem output against other global models, over the oceans, to assess model-to-model variability.

2. Have the authors thought about the uncertainty in the LBC estimates? The uncertainty would have important implications for pollutants that show a large background component in regional models. I would recommend that the authors discuss this species-specific uncertainty in the paper.

Minor/technical comments:

1. The authors need to provide details about where the database and tools are located and advice to users on the steps they need to take to build LBC for other parts of the world. I would also recommend that the authors create a sample work problem for the users to try before they use the tool for their intended purposes. In my experience, sample work problems help developers identify problems in tool usability and ensure wider usage.

2. Since the manuscript has focused on the application of the tool to CMAQ, it fails to talk about background pollutants and their properties that might be relevant for studies using other regional air quality models. For example: a. how would one deal with the LBC for models that have an explicit treatment of the aerosol size distribution? b. what would one do if they are concerned about trans-pacific transport of trace species like mercury or radionuclides?

3. How does the tool deal with different projection systems and varying grid resolutions (both horizontally and vertically), especially when regional air quality models are run at much finer resolution?

4. A little more clarification is needed on why and how the GEOS-Chem predictions are processed using Bowman et al. (2011) before comparing to the TES retrievals. I

was not able to assess Bowman et al. (2011) from the url in the citation. Please correct that.

5. As the other reviewer has pointed out, the boundaries most relevant for air quality modeling in CONUS is the Western boundary. Hence, I would recommend that the Western boundary comparison (ozone and other available species) be included in the main paper than in the appendix.

6. Page 4668, line 1: Needs to be "...time resolution ranges from hourly to...".

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