Geosci. Model Dev. Discuss.,
https://doi.org/10.5194/gmd-2017-125-RC1, 2017

Geoscientific Model Development Discussions

Interactive comment on "Errors and improvements in the use of archived meteorological data for chemical transport modeling" *by* Karen Yu et al.

Anonymous Referee #1

Received and published: 18 July 2017

SUMMARY: Well-written systematic evaluation of the biases in trace gas simulations resulting from the choice to run the model off-line, run at a reduced resolution, or use a different coordinate system in the CTM than the GCM. The analysis shows that the differences are substantial at least at fairly high resolutions. The authors also suggest a couple of easy fixes that ameliorate the worst of the biases.

General Comments: A more informative title would be useful.

The cubed-grid coordinate system used in the GEOS GCM is relatively new. Are other GCMS adapting this scheme.? What other global CTMs if any are being affected by the transition of GCMs from rectilinear to cubed-grid coordinate systems?

Did this analysis reveal any surprising insights into the types of analyses that should

be performed with off-line CTMs versus on-line CTMs?

Minor comments:

P3L24: Off-line 4x5 global simulations are increasingly uncommon. Perhaps you should use 2x2.5 and 1x1 as the standards here.

P4L27: "Both versions use the same archived data". Is this true? I thought the data was archived on a rectilinear grid and not a cubed-sphere grid?

The C48 percent difference due to rectilinear mapping and the use of a lower order advection algorithm is shown in Figure 3c. Is this difference large enough to warrant archival of meteorological fields on the native cube-sphere grid? Why wasn't a high-performance GEOS-Chem cubed sphere calculation performed at C360?

P8L10: Is the bulk convective scheme used in GEOS-Chem also used in other off-line CTMs that use RAS?

P12L7-15: The use of maximum mixing depths instead of mean mixing depths is an interesting approach. What transport modules other than RAS use these mixing depths as input? Is maximum mixing depth currently being archived?

Figure 7: Could you explain why the C48 and GEOS-Chem 2x2.5 with C48 RAS convective mass flux distributions are nearly identical at 500 hPa but quite different at other altitudes.

P13L20: Could you provide a prioritized wish list for improvements? e.g., Should Lin and Rood be replaced by Putnam and Lin? ... and if yes, what are the implications for data storage etc.

PL1320: Is retaining the nested-grid capability of GEOS-Chem a priority? If yes, how would these improvements also help nested-grid simulations or could they cause problems?

2017.

C3