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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Regional data assimilation of multi-spectral MOPITT observations of CO over North America" *by* Z. Jiang et al.

Anonymous Referee #2

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This paper presents a regional (N. America) inversion of CO fluxes using MOPITT observations and the GEOS-Chem CTM. The main thesis of the paper is that a high resolution regional inversion, with proper boundary conditions, can overcome some of the major difficulties facing CO flux inversion. These are transport and prescribed OH errors, which can contaminate the inversion results if they are very large.

This is a well written and easy to follow paper, and I recommend a minor revision before the paper is published. My main comments (described in more detail below), are that some further analysis of the errors would be helpful, particularly in the comparisons with in situ data.

1. P. 5336, line 5. It would be useful to know how these differences vary with height, and how they compare with in situ measurements. Do higher altitude differences have larger differences (because of the impact of long range transport)?

2. P. 5336, lines 24-26. Similarly, it would be good to know more about how these differences vary with altitude. Can comparisons with in situ observations bet shown here (in the same format as panel (d))? This can help to understand how the boundary conditions are affected by long range transport.

3. Also (from P. 5336) the use of MOPITT CO retrievals for the initialization and boundary conditions should make the a priori correlated with MOPITT observation errors. How will this affect the inversion results, given that it is generally assumed that model and observations are uncorrelated?

4. P. 5339, lines 11-21. It would also help the error analysis to show how the differences with INTEX-B (and perhaps adding NOAA aircraft data) vary with altitude. It seems that if the inversion is relatively unbiased, then the errors should be smaller near the surface, and become larger at higher altitudes where transport errors become important.

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 5327, 2015.