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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Inversion of long-lived trace gas emissions using combined Eulerian and Lagrangian chemical transport models" *by* M. Rigby et al.

Anonymous Referee #1

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General comments: This paper presents a new way for coupling global Eulerian and regional Lagrangian inversion methodologies together for improving the estimates of regional emissions. Overall the paper is well written and worth publication. I would like to suggest that further discussions are added concerning the following points.

Specific comments:

1) Implications of the 5-day measurement averaging period

The authors mention that measurement averaging periods of 1 to 30 days were tested as part of the uncertainty estimates of the inversion (p. 14703, ln. 16). Could the authors add further discussion on the results from these test runs, and describe how

5 days were chosen as the optimal averaging period? Also, I would like to suggest the addition of a brief description on the specific averaging scheme used in this study.

Questions over the 5-day measurement averaging are raised when looking closely at the timeseries presented in Fig. 8 of the discussion paper (p. 14717). The Gosan time-series presented in this paper suggests that pollution peaks at this site occur in a time scale of weeks-months, and that SF6 concentrations at Gosan are always significantly higher than those of other NH stations. This is not an entirely realistic representation of what is observed at Gosan, where along with the many pollution events that span hours-days, relatively "clean" concentrations close to NH background levels are observed as well (compare with the SF6 timeseries shown in Figure 1 of Kim et al. (2010, Geophysical Research Letters, doi:10.1029/2010GL043263). It would seem that the modeling runs with a shorter averaging period may be more suitable in this regard.

2) Comparison of SF6 emissions derived for China and Korea

This work finds that the EDGARv4 emissions for China and Korea (at least for the parts covered by the "local" regions) are significantly underestimated. Comparing this finding to previously published SF6 emissions in Vollmer et al. (2009, Geophysical Research Letters, doi:10.1029/2009GL038659), Kim et al. (2010) for China, and Li et al. (2011, Environmental Science and Technology, doi:10.1021/es104124k) for China and Korea may help substantiate the results derived in this study.

On a related point, should the EDGARv4 emissions for 2005 be scaled in some way for making a fair comparison to the modeled emissions derived for 2007-2009?

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 14689, 2011.