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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Sulfur hexafluoride (SF_6) emissions in East Asia determined by inverse modeling" *by* X. Fang et al.

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We thank the reviewer for his/her comments. The reviewer suggests that a "major rewrite is in order", however, no scientific arguments are presented in the review that would justify such a suggestion. Our responses to the two concrete points of criticism presented are given below:

1) Regarding not presenting the a posteriori emissions from India:

There is minimal sensitivity to emissions over Southeast Asian countries, e.g., Vietnam, Malaysia, Philippines, and practically no sensitivity to emissions in South Asia, e.g., India, so these countries are not considered in this study. Rather the contribution from emissions in these countries is to the so-called background mixing ratio and

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is thus taken into account there. The rather sharp gradients in emission sensitivity in some regions are due to meteorological effects, e.g., the barrier represented by the Himalayan mountain chain, which prevents air from south of it (India) to reach the stations under consideration here. It makes no sense to calculate a posteriori emissions for regions where the emission sensitivity is very low, as inversion results will fall back on the assumed a priori emissions in these regions, without any reduction of uncertainty. We calculated a posteriori emissions in southwest China region (but not for India) for three reasons: (1) footprint emission sensitivities in southwest China are still higher than in India; (2) emissions in southwest China are concentrated in Sichuan, Chongqing and Guizhou provinces which are in the east part of southwest China (see Fig. 8) where the emission sensitivity is still fairly high. Readers can see, however, that the uncertainties for southwest China are much larger than for other parts of China; (3) emission totals for China as a whole are not dominated by the emissions in the southwest but rather by emissions in the east where the emission sensitivity is much higher. Therefore, the uncertainties for the total Chinese emissions are relatively low, whereas uncertainties in Indian emissions could not be reduced by our inversion method. Thus, Indian emissions are not discussed.

2) Regarding the NOAA-2006 calibration scale:

Yes, the calibration scale does influence the measured mixing ratios and subsequently impacts on the inversion results. In our inversion system, the calibration scale does not matter much, because we determined the baseline for each station separately. Furthermore, we performed tests for the influence of different calibration scales. Our results show that using the NIES-2008 calibration scale as a reference increased the national emissions from all East Asian countries by less than 1.1% compared to the results from inversions using SIO-2005 as the reference and that the differences in emissions were even smaller when SIO-2005 referenced data were adjusted to the NOAA-2006 scale by multiplication by a constant factor of 1.002 derived from Rigby et al. (2010). We will cite Hall et al., [2011] where the NOAA 2006 scale is mentioned, in

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our revised manuscript. Hall, B.D., G.S. Dutton, D.J. Mondeel, J.D. Nance, M. Rigby, J.H. Butler, F.L. Moore, D.F. Hurst and J.W. Elkins (2011), Improving measurements of SF6 for the study of atmospheric transport and emissions. Atmos. Meas. Tech., 4 (11) 2441-2451, issn: 1867-1381, ids: 863AS, doi: 10.5194/amt-4-2441-2011.

Reference:

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(2)Rigby, M., Manning, A. J., and Prinn, R. G.: Inversion of long-lived trace gas emissions using combined Eulerian and Lagrangian chemical transport models, Atmos. Chem. Phys., 11, 9887-9898, 10.5194/acp-11-9887-2011, 2011.

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