

Interactive comment on “Xenon-133 and caesium-137 releases into the atmosphere from the Fukushima Dai-ichi nuclear power plant: determination of the source term, atmospheric dispersion, and deposition” by A. Stohl et al.

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For the resubmission of this paper to ACP we have made several changes and re-run all inversions presented in the paper. In particular, following criticism that our emissions both of Cs-137 and Xe-133 are too high, we have carefully sought for possible reasons that would cause such a bias and indeed found some small mistakes or inaccuracies in our analysis. We also added data and made other improvements. However, with all changes implemented, our total Xe-133 emissions are only slightly lower than our original emissions, 15.3 EBq instead of 16.7 EBq. The Cs-137 emissions are in fact

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slightly enhanced, from 35.8 to 36.6 PBq. We have made additional sensitivity experiments and this led us to slightly increase the stated uncertainty estimate for the Cs-137 total emissions.

The temporal variation of the emissions and the dispersion patterns remained nearly the same. Thus, while all numbers and figures in the manuscript needed to be slightly revised, the conclusions and all major statements of the paper remain the same. However, we have carefully checked our language and clarified all points that have caused misunderstandings. We have in particular given careful attention to uncertainties and to the fact that results over Japan are necessarily limited by the global model approach taken.

The following changes were made in the inversion set-up, which caused relatively minor changes of our results:

1) We have realized that activity concentrations are reported in Becquerel per norm cubic meter, whereas we have assumed this to be Becquerel per cubic meter. The correction factor depends on air temperature and pressure and varies between about 0.80 and 1.05 (with most values being around 0.95). This slightly decreases our retrieved emissions.

2) We have assumed that reported activity concentrations had been decay-corrected to the sampling end-time, which turned out not to be the case. We have now applied an appropriate decay-correction for the sampling period. This correction is completely negligible for Cs-137 but can be up to almost 7% for Xe-133 for 24-hour samples (less for 12-hour samples). This change has no effect on retrieved Cs-137 emissions but slightly decreases Xe-133 emissions.

3) Following the discussions with Rosa et al. (2011), we have revised our burn-up calculations from 30000 MWd/tU to 23000 MWd/tU. This has practically no effect on the Xe-133 inventory, but reduces the Cs-137 inventory of units 1-3 by 27%. Notice that the spent-fuel pool inventory of unit 4 was not changed. The effect on the inversion

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results is small and discussed in Stohl et al. (2011). The new burn-up may actually be too low, since measured radionuclide ratios suggest a burn-up of 26700 MWd/tU (Kirchner et al., 2012), in the middle of the value used in our ACPD paper and the revised value.

4) We have added Cs-137 data from two sites in Taiwan, which were made available to us. The effect of adding these data on the inversion results is small.

5) We have added Xe-133 data from CTBTO stations Panama City and Darwin. These data provide only a very weak constraint on the emissions and do not noticeably change the results.

6) MEXT has revised a few Cs-137 deposition measurements. Most of the values changed are now higher than originally reported. The effect on the inversion is very small because of the small number of affected samples. However, there is a somewhat more substantial effect on the sensitivity inversion that uses only the deposition data.

References:

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