Dear Andreas,

In the following we provide the replies to your specific questions:

1) The allocation of sources in far away places with little sensitivity (also given the observation by rev. 2 that this information is based on very small enhancements above background). I miss a discussion on the link to the population density and some more specification on how this was done.

We further changed the text as follows at pag. 8, lines 1-9:

"The uncertainties of the emissions, σ_x, need to be specified for every grid cell. As there is no information about uncertainties, we used the uncertainty in the matrix diagonal elements as defined in Stohl (2009) i.e., for inversion box *j*, $\sigma_x^j = \max(p*x_j, 2*p*x_{surf})$, with *p* being a properly chosen scaling factor and x_j the *a priori* emission flux in the inversion box *j*, x_{surf} the global emission value, as estimated by Rigby et al., (2013), homogeneously distributed in the grid cells corresponding to land areas. This σ formulation allows us to assign a high uncertainty also to those boxes with zero *a priori* emissions. We tested *p* values ranging from 50% to 500% of the prior emission estimate, balancing between (i) enough flexibility in emissions to allow adjustments that better fit the observations and (ii) not too high flexibility that might lead to over-fitting of the observations and to noisy and unrealistic emissions. The *a posteriori* flux assigned to the inverted box is distributed according to the population density."

2) p. 8214. l11.: I was also puzzled by the not-inclusion of the Zep data. A statement should at least be made why this station was not included.

In the revised version we added this sentence (pag 4, lines 7-10)

"Time series from ZEP have not been included in the analysis because tests performed on one year of data (2008) showed that the inclusion of this remote station, where no MCF enhancements are observed, did not substantially alter the emission magnitudes we derive here (derived fluxes differed by <2% with the inclusion of ZEP)."

Did you mean that we need to add more?

3) Comment on p. 8225, l.7 : I agree with the reviewer that the uncertainties assigned seem extremely (and unrealistically) low. I think that this is linked to the use of the error of the mean. An error of the mean can (i) only be used when one has repeated measurements of the exact same quantity (while emission may vary in time) and (ii) only on purely statistical uncertainties. Systematic uncertainties (arising e.g. from the method itself, from uncertainties in deriving the baseline etc.) cannot be reduced by multiple measurements.

We use the 95% confidence interval rather than the simple standard deviation because our aim is to estimate the precision of the annual average emission fluxes, while the standard deviation will give account of the variability of the three-hourly data only. We checked once again our analysis obtaining the same values. However, please note that the final error associated to the average of the three station emissions is quite large, between 20 and 40%. Since we agree that the very small errors associated to the single stations could look unrealistic, and since the best estimate is that corresponding to the combination of the estimates of the single stations, we considered more correct to give only the average of the three aggregated stations with the relevant error (95% confidence interval of the average emission), as mentioned above.

The text has been changes as follows at Pag. 10 lines 17-25 and in Figure 8.

"The SRR_v threshold (1500 s m^3kg^{-1}) is identified as the value for which the annual emission flux converges towards a limit value. The plots in Figure 8 (top panels) report the average annual emission fluxes together the 95% confidence interval of the annual average as obtained by three-hourly estimates of the three stations. The bottom panels report the number of measurements per year above the identified threshold. The emission estimates from the SEF region are 0.5 ± 0.1 and 0.5 ± 0.2 Gg yr^{-1} in 2008 and 2009, respectively. The obtained estimates using the PSA method are almost a factor 2 larger than those obtained from the inverse modelling, as reported in Table 2. This is expected as the inversion results are bound towards *a priori* emissions that are clearly too low for the SEF area. This leads to a low bias also in the obtained *a posteriori* emissions. "

4) Comment on p. 8228, l. 15: please indicate in the manuscript how the maximum error is derived.

We added the definition at pag. 13, lines 9-13

"In addition, for the years 2008-2009, for which an alternative meteorological data is available, we investigated the influence of the meteorological data resolution. These tests provided a set of estimates, whose average is our best estimate, which is affected by an uncertainty corresponding to the maximum error. The maximum error is defined as the semi-difference between the maximum and minimum value of the *a posteriori* emission fluxes. In addition, we derived the percentage ratio (Rp) between the maximum error and average emission values."

Best wishes

Michela