

***Interactive comment on “Source apportionment of submicron organic aerosols at an urban site by linear unmixing of aerosol mass spectra” by V. A. Lanz et al.***

V. A. Lanz et al.

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We would like to thank Anonymous Referee #3 for reviewing our manuscript and raising interesting questions. The answers to the specific comments can be found below:

1. Regressing the measured data on the identified six factors corresponds to solving the CMB problem what is different from the approach by Zhang et al. (2005) (see manuscript: p. 11684, lines 8-11). Solving a CMB-like model correctly is beyond the scope of this study because this should involve data weighting, dealing with (multi-)colinearity, estimating uncertainties of a priori assumed profiles and other specific issues.

2. This issue is mentioned on p. 11684, lines 20-23: "Under carefully selected condi-

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tions, OOA and HOA seem to be accurate estimates for SOA and POA, respectively (Zhang et al., 2005b; Volkamer, 2006)." - but we fully agree with the reviewer that this reference should be omitted in the first paragraph on p. 11684.

3. The reference of Quinn et al. (2006) given by the referee will be added in the revised manuscript. Buset et al. (2006), who also included organic fragments m/z 44 and m/z 57 (and m/z 43, in addition) in their factor analysis (based on ME-2) will be mentioned as well.

4. See answer to P. Paatero (<http://www.cosis.net/copernicus/EGU/acpd/6/S6069/acpd-6-S6069.pdf>, item 1)

5. All aerosol mass spectra presented in Fig. 3 result from a free factorization, i.e. no a priori known profiles were assumed. For verification, those profiles were compared to measured reference spectra. The reference spectrum for charbroiling was derived from the data, as no such measured mass spectrum is available from literature, but it has not been used in the factor analytical model. Also note that we have stated in the present manuscript that "Zurich-Kaserne might be slightly biased toward charbroiling and wood burning particles because of some local emission events" (p. 11707, lines 13-14).

6. To our knowledge, NO<sub>x</sub>-emitting fossil fuel- or coal-burning plants are not existent in the area around Zurich. Switzerland's overall electrical energy production is based on hydro- and nuclear-power accounting for approximately 60% and 40%, respectively.

7. NO<sub>x</sub> is measured at this location with a molybdenum converter. This means that oxidation products of NO<sub>x</sub> like PAN or nitrates are, at least to a large extent, also measured by this technique. (One could assume that nitric acid is lost to a larger extent due to efficient dry deposition between source and receptor and, therefore, can hardly be measured by NO<sub>y</sub> instruments either.) At a more rural station near Zürich, the ratio of NO<sub>x</sub> measured with a photolytic converter (without interferences) versus NO<sub>x</sub> measured by the same method as here in Zurich was 0.72-0.76 for average concentrations

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of about 5 ppb (Steinbacher et al., submitted to Journal of Geophysical Research). In Zurich, we expect even less relative interference due to more local emissions and, thus, larger NO<sub>x</sub> contributions to NO<sub>y</sub>. The average NO<sub>x</sub> concentration in Zurich is more than 3 times higher than at the more rural station near Zurich. Overall we assume a bias of the ratio NO<sub>x</sub>/NO<sub>y</sub> to be considerably less than 25%. In any case, it is certainly correct that the HOA/NO<sub>x</sub> emission ratio from our ambient measurements systematically underestimate the true emission ratio because of the reactivity of NO<sub>x</sub>. As indicated above, we expect that this bias is rather small at the urban background site in Zurich where NO<sub>x</sub> levels are dominated by emissions from the close vicinity. The HOA/NO<sub>x</sub> ratio found should of course not be overemphasized, however, the agreement between the value found and literature values gives some additional confidence in the estimated HOA activity. In the revised manuscript, we will add a sentence where we mention this bias.

#### References

Buset, K. C., et al.: Use of advanced receptor modelling for analysis of an intensive 5-week aerosol sampling campaign, *Atmos. Environ.*, 40, Suppl 2, 482-499, 2006.  
Quinn, P. K., et al.: Impacts of sources and aging on submicrometer aerosol properties in the marine boundary layer across the Gulf of Maine, *J. Geophys. Res.*, 111, D23S36, doi:10.1029/2006JD007582, 2006.  
Steinbacher, M., Zellweger, C., and Schwarzenbach, B.: Nitrogen oxides measurements at rural sites in Switzerland: bias of conventional measurement techniques, *J. Geophys. Res.*, submitted, 2006.

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Interactive comment on *Atmos. Chem. Phys. Discuss.*, 6, 11681, 2006.

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