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Atmospheric
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Discussions

Interactive comment on “Geochemical perspectives from a new Aerosol chemical mass closure” *by* B. Guinot et al.

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Answer to Referee # 2 (received January 20th, 2007)

We thank you for your comments which will help to improve our work.

General comments:

As suggested too by the other reviewer our work relies on its “self-consistency” and additional value would be given by comparison with more traditional approaches using dust elemental data . We could find such data for Beijing aerosols from He et al (2001) and Sun et al. (2004) for mass, major ions and BC, OC components AND multi- elemental composition for fine and coarse particles. Using one of the classical equations accounting for dust oxygen and hetero-atoms, mineral dust mass may be evaluated as: Dust mass = 2.20[Al] + 2.49[Si] + 1.63[Ca] + 1.42[Fe] + 1.94[Ti] [E1] (from: Pettijohn F.J. . In : “ Sedimentary Rocks ”, “ Earth data ”, (NY, Harper and Row), 1975) we are thus able to provide a comparison between the two approaches which will be presented and discussed in the final version of the manuscript. Table T1 presents our f ratios obtained by our mass closure and parallely by the classical dust mass evaluation. They compare very satisfactorily. These results appear to support our simple method as a valuable and robust alternative to assess aerosol mineral dust content.

Table 1 : Urban f ratio obtained in Beijing from our study and from other data sets

This work: Winter 2003: 0.07 (fine) and 0.07 (coarse) Summer 2003: 0.12 (fine) and 0.12 (coarse) Summer 2004: 0.09 (fine) and 0.09 (coarse) He et al. (2001) year 1999-2000: 0.10 (fine) Sun et al. (2004) summer 2002: 0.10(fine) and 0.08 (coarse) winter 2003: 0.07(fine) and 0.09 (coarse)

As mineral dust composition may vary with dust source location, we may assume that our method will distinguish various inputs of Ca-containing dusts. This is the case for Beijing dust aerosols as shown in this table or table 3 of our manuscript and discussed in the body of the manuscript (p 17-18). This is one argument (the other being K sensitivity to aerosol origin or age) to assess that our closure give some insights on particle geochemistry.

Error evaluation We recognize that SAMPLING ERROR has been OMITTED while focusing on analytical errors only. We agree that a minimum of 10-15% is due to sampling (mostly volume evaluation and sampling representativity) especially due to the need of at least 3 different sampling probes to conduct air sampling for fine and coarse particles for carbon and ion measurements. This will be re-evaluated and discussed in the final version of the manuscript.

Specific points - insoluble/soluble calcium (abstract and manuscript p 12033) and Ca2+ (obtained by IC after dissolution) representativity: Sciare et al (ACP, 2005) have compared Ca2+ obtained from prolonged US extraction and from PIXE in various samples from Crete island (where dust amounts are significant). Their results show a good agreement (less than 10% difference) between the 2 data sets. So it may be assessed that Calcium is almost entirely extracted and analysed during the process. - The water content of aerosols at 30% humidity is less than 10% of the ion content (Sciare et al., 2005 and references herein). So the presence of water in our samples weighed at less than 30% humidity may be considered as neglectable. However, we will mention this point in the manuscript. - The filters are not coated by Apiezon(we weight them) but this is not necessary because aerosols are filtered and not collected by impaction. - Negative and positive artefacts for C: we apologize for mentioning negative artefacts in page 12027 line 5, since only positive artefacts are minimized when heating samples at 60°c prior to analysis. This will be corrected. - Figure 1 (TSP/PM-10): our SFU were open-face probes with no cut-off. However we operated at a flow rate of 1m3/hr (and not high vol). So may be TPM is more appropriate than TSP. - Figure 3: It is a typo to have 3b and 3c identical. 3c is actually the reconstructed mass for the coarse fraction. Both 3c (coarse mass) and 3d (fine mass) are actually very good fits after adjustments of dust mass and POM mass for each sample from the 2 coefficients obtained for the whole sample data set as explained in the text.

We agree that PLOTS are poor and all of them will be up-graded

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Interactive comment on Atmos. Chem. Phys. Discuss., 6, 12021, 2006.