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Atmospheric Chemistry and Physics Discussions

Interactive comment on "The transport history of two Saharan dust events archived in an Alpine ice core" *by* H. Sodemann et al.

Anonymous Referee #2

Received and published: 4 October 2005

General comments: This paper presents chemical data derived from an ice core analysis in correlation to the variation of meteorological parameters. The use of back-trajectory calculations with additional atmospheric information should give a more precise explanation for the chemical structure in the ice core for periods of Saharan dust deposition. The paper includes criteria for the use of selected data for mobilisation, transport and deposition of dust as well as an extensive description of the meteorological situation during the episodes and limitations of used model. It is a valuable contribution to the understanding of chemical signatures in ice core data. However, because of some major concerns it is recommended to accept the paper with major revisions.

1. The aim of the paper is not really clear. Do the authors want to show the successful operation of a method or a more reliable interpretation of chemical data?

2. The paper is too long. It contains many common statements and transitions (7518 L 8-17 and 7518 L 18-20). The authors should condense the information in the data without unnecessary repetitions.

3. The discussion of meteorological data is too long. It should give the reader the most important points to follow the analysis.

4. The chemical data in the ice core have to be confirmed by chemical data from the deposition site or from other measurement points in the Alps during the dust events (e.g. the three weather stations in the vicinity of Piz Zupó or at least from the JFJ - ion chromatographical analysis during CLACE-1 - Henning et al. 2003).

5. The correlation of the meteorological and chemical data to the ice core depth is an important statement of the paper. However, the dating method of the Piz Zupó ice core will be published in a separate paper, which is not available at the time of this review. The authors should give a short overview of the dating method including information on the time resolution of the chemical analysis. Please correlate the depths in the ice core to the months of the year 2000 (Fig. 3).

Specific comments:

P 7501 L 21: What is the time period correlating to the ice core sections of 4-5 cm and what is the standard deviation of time determination?

P 7501 L 23/24: Which are the instrument, the experimental parameters and conditions to analyse anions and cations? Please describe the IC system and the stable isotope system.

P 7502 L 22: Please describe “the OC4v4 algorithm” with a few sentences and cite the literature.

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Interactive Comment

P 7507 L 15/16: “seasonal variations of 18O and NH4” - Please show the data for this statement grafically.

P 7507 L 19 - P 7508 L 1: The time lines of the ions C2O42-, K+ and H+ should be inserted into Fig. 3.

P 7508 L 4: “isotopic signature and the chemical species were typical of winter conditions”. What does this mean? Please show data and cite references.

P 7508 L 7: Please show the TSP data from Jungfraujoch (JFJ) and combine the IC data in Fig. 3 to results of ion chromatografic analysis from Jungfraujoch (see e.g. Henning et al. 2003) to gain some valuable insights.

P 7508 L 18-21: This statement suggests that chemical data are available from the stations Robiei and Piotta. Please show these data. Please show locations of the two stations.

Section 5 (P7509-7515): the meteorological analysis is very long and for the reader it is difficult to extract the main statement in correlation to the ice core chemistry. It contains many suggestions without verified data in comparison to the chemical data from the ice core.

P 7517 L 27: “Single particle element spectra...” change to “Single particle mass spectra...”

P 7518 L 1-2: “In particular, calcium and iron oxides were more abundant during phase M3.” I can not see evidence for this statement in the cited paper. The authors should check their data in comparison to the references.

P 7518 L 8-17: This paragraph is not very helpful. It contains not a solution, but a lot of speculations.

P 7519 L 21-23: “...while during the March event in addition polluted air masses interacted with the dust plume...” The concentrations of nitrate and ammonium should be

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discussed in comparison to IC data (Henning et al. 2003) and single particle data (Hinz et al. 2005) from the JFJ.

P 7520 L 19 / Figure 12: Please use as unit for height “meter” (e.g. left hand side of the illustration) and as unit for pressure “hPa” (right hand side).

P 7518 L 6-10: “Particles sampled at JFJ during 18 March...” - Obviously the authors misinterpret the Figure 5 in Hinz et al. 2005. The three spectra patterns reflect particle groups on both days and not Figure 5A for March 18 and Figure 5B for March 23. A correction and new interpretation is necessary. IC data from JFJ could be helpful for this purpose. Did the authors verify the back-trajectories for JFJ with respect to the dust episodes and in comparison to trajectories of Piz Zupó? Are there any differences?

P 7525: Conclusions A future outlook should reflect whether or not the method is applicable to the mobilisation of other sorts of air parcels (e.g. emissions from heavy industries, power plants etc.) and what data are necessary to apply the method to such data.

Table 1: An additional line for the October data should be included.

References: Henning, S., E. Weingartner, M. Schwikowski, H.W. Gäggeler, R. Gehrig, K.-P. Hinz, A. Trimborn, B. Spengler, U. Baltensperger (2003) Seasonal Variation of Water Soluble Ions of the Aerosol at the High-Alpine Site Jungfraujoch (3580 m asl). J. Geophys. Res. A 108 D1, 4030.

Interactive comment on Atmos. Chem. Phys. Discuss., 5, 7497, 2005.