

Interactive comment on “Complex refractive indices of Saharan dust samples at visible and near UV wavelengths: a laboratory study” by R. Wagner et al.

Anonymous Referee #2

Received and published: 29 September 2011

GENERAL COMMENT

The manuscript presents an extensive study on the complex refractive index of mineral dust which is a key unknown in the determination of mineral dust impact on climate. The study uses re-suspensions of five different mineral dust samples from the Sahara. Careful analyses of dust chemical composition, particle shape, size distribution and optical properties like extinction and absorption are presented. The data serves as input for an in-depth modelling study on the complex index of refraction of the investigated dust samples. Particular emphasis is put on the link between iron content on one hand and the absorption coefficient as well as applied mixing rules on the other hand.

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From its scientific quality the manuscript makes a significant contribution to an important area of research. However, the quality of presentation is poor and the manuscript is not acceptable for publication in its current form. Major revisions are required concerning the structure and presentation of the manuscript. Furthermore, the manuscript should be shortened significantly. Part of the suggested reduction may be achieved by restructuring the manuscript and by removing duplications in the text.

SPECIFIC COMMENTS

1. Introduction: The description of work performed in particular during the SAMUM studies is too detailed and should be shortened significantly. Interested readers may refer to the original papers instead. The entire paragraph from page 21366/line 24 to page 21367/line 16 should be moved to Section 2 and should be checked for duplication.
2. Experimental: The description of aerosol generation and optical methods is too lengthy and requires a clearer presentation. If the authors want to stick to the detailed presentation, part of the material should be moved to an appendix. Otherwise the reader is unable to catch the structure of the conducted experiments.
3. Desert Dust Samples: In this section method description, presentation of results and discussion is mixed. It is highly recommended to divide this section into clearly identifiable subsections on methods, results and discussion.
4. Inversion scheme: As in the Experimental Section, details of the applied methods may be shifted to an appendix. This section is by far too long and important information is getting lost. The authors may focus on the important pieces of information they want the reader to catch.
5. Results and Discussion: The authors may think about focusing on discussion only because part of the results is already presented earlier. They should also check for duplication between Section 5 and Section 6.

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6. Figures: The figure captions of Figs. 7-9 are far too detailed. The authors should shift part of the caption to the text and check for duplication. Figure 9 should be revised because axis labels and data point labels are hardly readable.

7. In Fig. 14 the authors present an intercomparison between two applied methods for measuring absorption. As is stated correctly, both methods (filter-based Spectral Optical Absorption Spectrometer SOAP and 4-wavelength Photoacoustic Spectrometer) show similar trends in the wavelength dependence of the absorption coefficient. However, the authors do not present a quantitative analysis of the absorption coefficient measurements by both methods. Since the absorption coefficient is the key reference parameter for the applied inversion scheme for the complex refractive index retrieval, at least some kind of quality assurance of the absorption coefficient measurement is highly recommended. One potential way could be a comparison of absorption, scattering and extinction in case an integrating nephelometer was also used in this study. If no integrating nephelometer data is available the authors may repeat at least one retrieval of the complex refractive index also for 4-wavelength photoacoustic data in order to check the uncertainty in the retrieved results caused by uncertainties in the input data on aerosol absorption.

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 21363, 2011.