Atmos. Chem. Phys. Discuss., 10, C4665–C4667, 2010
www.atmos-chem-phys-discuss.net/10/C4665/2010/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Observations of Saharan dust microphysical and optical properties from the Eastern Atlantic during NAMMA airborne field campaign" *by* G. Chen et al.

Anonymous Referee #2

Received and published: 30 June 2010

General comments. My understanding of research is as follows: I have a question which can be solved with scientific means. So I'm looking for instruments or methods and locations to tackle this question. If instruments and/or methods are not available, I'm trying to develop them. If that is too expensive and/or too difficult, the question cannot be tackled this time. It seems to me that the authors follow a quite different approach. They are offered a logistic opportunity (an aircraft and a campaign). They look around in the laboratory; collect a number of instruments and action. The scientific question is raised after the campaign and the suitability of the instruments also is tested after the campaign (page 13452, line 5).

Sorry, I'm unable to honor such approach.

In addition. The authors have done a great effort to scan the literature. But with one exception (a monograph from 1983) all the reference are mainly from the last decade. There is scientific life before that. Despite such general remarks, a few specific comments are added.

Specific comments. Page 13448, line 3: This is a very limited view and not very exact. Such numbers are empty, if not specified with an upper size limit for particles enclosed. Also one has to distinguish what has been liberated and what arrives after traversing the North Atlantic Ocean. Mineral dust (< 20 μm diameter) is estimated for 2150 Tg/year (IPCC) liberated from the deserts globally. The Saharan desert is about 30% of all deserts. So about 700 Tg/year are leaving the Saharan desert. For a deeper understanding of this subject I recommend "Jaenicke, R. (2007) Is Atmospheric Aerosol and Aerosol? - A Look at Sources and Variability. Faraday Discussions 137, 235-243". Page 13448, line 7: Fig. 1 could be eliminated. Such Figures have been published much too often. Page 13451, line 20: This upper limit is very crucial and makes any conclusion about the Saharan aerosol in general very questionable. Page 13452, line 20: With most of its measuring range above the cut-off of the airplane inlet, the use of such an instrument is questionable. Page 13452, line 25: A Figure is needed showing the size range of the used instruments and their collection efficiency together with the efficiency and cut-off sizes of the airplane inlet. Page 13454, line 11: Where in the duct have the particles for electron microscopy been collected? Are particle investigated smaller than 4 μm only? Page 13454, line 14: Table 1 is trivial: Saharan dust particles in the Saharan layer and sea salt particles in the boundary layer! Page 13455, line 17: These are number concentration densities rather than number concentration, see Fig. 5. Page 13455, line 23: Are these dry particles? Number densities are reported to ambient pressure and temperature. Then also ambient humidity is expected. With ambient humidity the density value should be closer to 1 gcm-3. Page 13455, line 26: In view of the many uncertain circumstances, the thoughts about the shape

ACPD

10, C4665–C4667, 2010

factor are more or less useless. If water is attached to the particles, the shape factor is getting closer to one anyhow. I recommend "Yang, J. et al (1999) The Condensational Growth of Aerosol Particle and Its Effect in Aerosol Measurements. J. Aerosol Sci. 30, S69-S70" for reading. Page 13456, line 16: My remarks for the shape factor also are valid for the index of refraction. Page 13460, line 11: Such critical conclusions are to be praised, but should have influenced the planning of the instrument selection. Page 13462, line 7: The term "NAMMA dust layer" is not very exact. It is not caused by NAMMA hopefully. Why don't you term it "Saharan dust layer"? Page 13462, line 9: See my earlier remarks about the influence of the humidity on the measurements of size distributions and the assumptions about the density and refractive index. Page 13462, line 19: Better term it N .01-4 μm (indicating the size range). Page 13462, line 26: Between 200 and 300 °C cellulose is burning. Do you assume that cellulose is a volatile compound? See also "Eglinton, T.I. et al (2002): Composition, age, and provenance of organic matter in NW African dust over the Atlantic Ocean. GEOCHEMISTRY GEOPHYSICS GEOSYSTEMS 3, 1050". Page 13463, line 15: Table 4 reaches from 0.6 to 6 μm while Fig 5 reaches from 0.06 to 5 (or 4 taking the inlet into account) μm. Why that? Page 13465, line 21: The size distribution definitely is changing. See "Schütz, L. (1979) Sahara Dust Transport Over the North Atlantic - Model Calculations and Measurements. SCOPE 14: Sahara Dust: Mobilization, Transport, Deposition. 267-277". If you have a different opinion, prove that the Schütz data are wrong. Page 13469, line 25: Make up your mind and present size distributions whether linear or logarithmic on the y-axis. Page 13472, line 19: If the size distribution remains rather unchanged during transport, then please explain the deep sea sediments across the Atlantic Ocean in this region.

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 13445, 2010.