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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Arctic smoke – aerosol characteristics during a record air pollution event in the European Arctic and its radiative impact" *by* R. Treffeisen et al.

Anonymous Referee #1

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General comments The paper is dealing with a pollution episode which was caused by a coincidence of a special weather situation and wide agricultural fires. The paper is well-written and there are no major concerns in its scientific quality. One general introduction into the episode would help the reader (time series of aerosol mass and/or carbonaceous species). Now the reader should go to make a look at Stohl et al., which is not so convenient. Some suggestions are below in the specific comments.

Specific comments

Title: I would like suggest a small change, the suggested form is "Arctic aerosol characteristics during a record smoke pollution event in the European Arctic and its radiative

impact”

Abstract, p 2: add "number": The aerosol number size distribution was characterized as having an accumulation mode centered at 165-185 nm

p 3 and afterwards: it is first said that smoke is from peatland fires, but later mostly it is used the term agricultural fires. Please, be more specific concerning what is burning.

p 4 and afterwards throughout the text: When the authors are discussing about the mixture state of the aerosol, they should somehow take into account the fact that soot is primary and organic carbon is a mixture of primary and secondary particles; thus, for example in Aitken size range there is most likely minor amount of soot compared with organic carbon. - Although it is hard to believe that this is really the case: (p. 18), “soot fraction is best described as an external mixture”, p 20: “soot is evenly distributed over the entire size spectra”

p 6, chapter 3 first para: what does the following sentence mean: “ There was no evidence of dry or wet depositionĚ”, some dry deposition happens even in the accumulation mode size range; please, clarify that.

p 11, second para: it may be for reader hard to understand the low DMPS/CPC ratio if you don’t explain that the difference is because nucleation event particles are too small to be detected with this DMPS configuration. Please, clarify this paragraph.

p 13, Absorption measurements: This is a bit confusing, because the authors are speaking about Particle Soot Absorption Photometer, which is commercially available (Radiance Research), and according to my knowledge has much lower uncertainty than mentioned here. I suggest to make changes and clarifications according to this fact.

Chemical measurements, line 5: replace “The instrument setup” with “The sampling setup”, because it may refer otherwise to the thermo-optical method. The major concern in this chapter is the positive artifact (collection of organic vapours by the filter).

ACPD

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The authors should explain how they manage this issue: how this may affect the results: OC concentrations and contribution of watersoluble OC. Also I would like to recommend to be more careful when speaking about compounds which may be either in the smoke or come from sea salt (nss-sulfate, nss-K, nss-Ca).

Technical corrections

p 4 line 2: should be “one thirdĚ) p 15 second para: should be “linear regression” and “1 μm”

Interactive comment on Atmos. Chem. Phys. Discuss., 7, 2275, 2007.