Atmos. Chem. Phys. Discuss., 8, S3266–S3269, 2008
www.atmos-chem-phys-discuss.net/8/S3266/2008/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Long-term measurements of carbonaceous aerosols in the eastern Mediterranean: evidence of long-range transport of biomass burning" *by* J. Sciare et al.

Anonymous Referee #1

Received and published: 31 May 2008

This is an interesting paper that deals with the sources and origins of carbonaceous aerosols in the eastern Mediterranean area based on a multi-annual data set of aerosol measurements. From the relations between the concentrations of carbonaceous and inorganic components the authors estimate the contribution of sources of particulate carbon and specially the consequences of biomass burning, in a seasonal basis.

The paper is well thought and I agree in general with the treatment and conclusions although some points are less correct and or less clear and need to be clarified and or consubstantiated.

The authors use the term BC to describe the non-organic, non-carbonated, part of the

carbonaceous aerosol. The terms BC (Black Carbon) and EC (Elemental Carbon) are used frequently to specify this fraction ; usually the term BC is employed when pure optical methods are used in the analytical determination and quantification (such as the aethalometer) and the term EC is employed more frequently when measurement is done by thermal methods (or thermo-optical methods). Here in the paper three (four) different methodologies are used. I would like that the subject would be addressed and referred, and that one or two sentences would be added explaining the causes for the choice of nomenclature applied.

The sampling of the aerosol is performed with two lines in parallel, with a filter holder having a quartz filter for carbon analysis and a SFU using Nuclepore filters for ions and other constituents. Sampling seems to be done with one week extension periods. Taking into account the long sampling extension, the atmospheric concentrations of particles at the site and the characteristics of Nuclepore filters I wonder if the cutting size characteristics of the Nuclepore filter are maintained during the extended sampling events. Clogging of filter pores are probable in these seven days sampling extensions. It is not clear from the paper but it seems that sampling over the quartz filter is also done during one week periods in parallel with SFU. Please add information concerning the expected size collection (TSP?) and sampling flow rate of the quartz filter line.

Page 6954 lines 5-10 - It is not clear the advantage of heating the filters with the sample at 60 žC for 20 minutes, prior to the analysis, to minimize artifacts. By doing so what is achieved is the evaporation of any semi-volatiles, either the ones adsorbed on the filter surface or those collected as particles. Furthermore if the reaction of volatiles (VOCs) with active sites in the filter result in a strong chemi-adsorption the heating of the filter may remove the particulate semivolatiles without desorbing the volatiles (VOCs) from the filter surface, introducing then a higher artifact.

Page 6955, equation 1 - Adopting of a R value of 1, considering that the filter deposit is low, is questionable and should be explained. Although the flow rate of aerosol sampling is not known, the fact that samples extend for one week, presumably will

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accumulate too much material to maintain the R value as 1.

Page 6958, lines 1-10 - A mean difference of 0.7 μg/m3 between PM and PMCMB is reported. From Table 1, a value of 8.88-8.47= 0.41 can be estimated. Clarify!

Page 6960, lines 18-22 - The fact that light transmission increases during the analytical step at 850žC, under helium, in the NIOSH protocol is not the theoretical cause for the lower BC values under the NIOSH protocol, by comparison with the IMPROVE methodology. If the BC reacts in these NIOSH conditions with oxygen from oxides, for example, this would only reflect on the calculated levels of Pyrolitic Carbon. The filter light transmittance control during heating has precisely the objective of compensating for phenomena of carbonization and decarbonisation processes during the evaporation of organic carbon. If the initial transmission level of the filter is used for separation between BC and OC, then any previous pyrolisis and oxidation of BC are compensated (presuming that all the OC has evaporated, previously to regaining the initial transmission, and that the light absorbity of initial BC and pyrolysis formed BC are equal). But if the colour of inorganic compounds absorbing light change irreversibly during the heating step at 850 łC under helium, in reducing conditions, (as it was described in Sciare, 2003b) then this heating step under NIOSH protocol could introduce errors in the calculation of BC. It is interesting to notice that the average relative differences between absorption coefficients of the aethalometer with and without inclusion of Fe2O3 in Figure 2 seem to be of the order of 15%, value similar to the differences in BC calculations by NIOSH and IMPROVE type methods.

Page 6961, equation 4 - Equation 4 seems to be a kind of moving average and I could not understand neither what it represents nor its objective in the paper. If I understood, Ci-1, Ci and Ci+1 are the monthly averages corresponding to month i minus one, month i and month i plus one. Therefore Ci_bar is not a weighted monthly mean concentration. If I understood the meaning of equation 4 then the result of the equation would smooth the monthly mean results resulting in not so high maxima and not so low minima. However this is not shown in Figure 5.

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Page 6963, line 10 - substitute "poorly" with "less".

Page 6964, lines 5-10, The monthly mean nssK taken from figure 4 is around 55 ng/m3 and not 50 ng/m3. So it is more correct to say that this is a round average using May and June months (there are several of these inaccuracies in the paper, as referred by referee 2, that should be avoided.)

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 6949, 2008.