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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Multiyear chemical composition of the fine aerosol fraction in Athens, Greece, with emphasis on winter-time residential heating" *by* Christina Theodosi et al.

Anonymous Referee #3

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A long data series of PM2.5 speciation (more than 800 samples) obtained at an urban background site in Athens during a two-year period is presented. Description is focused on the winter period in order to quantify the impact of heating emissions and to define effective mitigation actions. A Positive Matrix Factorization was applied, identifying six sources for PM. The importance of domestic heating in winter is highlighted, and authors suggested a significant contribution of biomass burning (BB). However, this contribution can be overestimated (see below). Results obtained with an aethalometer are used for the interpretation of the BB contribution. However, these measurements are not properly described. The text is long and redundant. An effort must be made to reduce the length of the text Some minor clarifications are needed before publication

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in ACP Page 3, section 2.2. Please, clarify the analysis performed for the 24h and the 12h samples. Were the 24h and 12h filters collected simultaneously during winter? Did you analyze total K, Mg and Na by ICP? Only the soluble fraction of these elements is presented, However, the contribution of the insoluble fraction of these elements can be important during dust events. Section 2.3: did you consider both, 24h and 12h filters for the PMF? Why did you perform the PMF analysis for the winter samples only? A higher number of cases may favor the identification of factors. Section 3.1 and 3.2. There are more recent papers on PM2.5 levels and composition and source apportionment in Europe. See Amato et al., Atmos. Chem. Phys., 16, 3289-3309, 2016 Section 3.2.1. Please, use ranges from <DL (specify for each component) to the maximum value; avoid referring to 0 concentrations. Page 7; line 12. These elements (Mn, Cr, Ni, V, As. . .) may also be associated to mineral dust. I would say ". . .of major anthropogenic origin. . ." Section 3.3; page 7, line 31. How did you estimate the sea salt fraction of these PM components? Please, add references. Page 8, section 3.4.1. The combined effect of meteorology (less developed boundary layer, low wind speed. . .) and the increase of the domestic emissions result in a poor air quality in winter. Thus, page 8 – line 28-30; the increase of PM2.5 concentrations during the night in winter may be related to the lower development of the boundary layer during the night and not only to the increase of the emissions of domestic heating. More information on the aethalometer measurements and model is needed . The description of the BC measurements should be included in the section 3.4.2 on carbonaceous components. Does the daily evolution of BCwb differ from that of BCff? Page 10. Lines 28-32. The insoluble fraction of Mg, K and Na is usually associated to the dust fraction. Page 11, lines 10 to 15. Mineral K is usually associated to clay minerals more than to carbonates. Could you check the correlation between K+ and Al for dust events and for non-biomass periods? Page 11, line 25. Please, replace . . .2011)" by . . .2011)." Page 14. Section 3.5.2 Line10. Please, add a figure or a reference for BB vs BCwb correlation. Line 11. Please, specify the period for the ACSM measurements carried out by Bougiatioti et al., 2014. The PMF profile for BB is characterized by a high contribution of nitrates.

This correlation can be due to covariation induced by meteorological factors Authors explained the association of nitrates with the BB factor by high emission of NOx by biomass burning and by the lower acidity. However, as explained later NOx better correlated with the vehicular emission factor. May a fraction of nitrates be derived from fuel oil emissions? Then, the contribution of BB may be overestimated. Page 15. The vehicular source is characterized by a relatively higher contribution during night in the winter period. Can be this diurnal trend related to a significant contribution of fuel oil domestic heating? The vehicular source highly correlated with BCff; does the diurnal trend of BCff reproduce the trend of vehicular traffic? Is there other source of BCff during night in winter? Page 15, Line 20. V/Ni derived from fuel oil combustion sources is usually associated to SO42-; however, SO42- is not significantly associated in this factor

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