

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 #1

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The paper by Theodosi et al. reports about the large observational study monitoring particulate matter sources in central Athens emphasizing contribution of biomass burning, especially during winter and in particular during the night. The study presents no new knowledge, nor scientific advancement, although it provides very detail account of sources and is methodologically correct. The paper is often buried in details and often repetitive and better focus on the main idea is necessary. At the moment the paper looks more like a report than scientific paper. Better focus and summary at the end of sections is necessary and perhaps separating results from discussion. The paper ends abruptly with conclusions as an extensive summary. Quite an improvement (including the English) is needed before the paper can be accepted for publication.

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Comments:

I guess the authors are overstressing when repeatedly refer to the Greater Athens Area, because a single station in the city centre can hardly described the entire Greater Athens area. Clearly more stations are necessary to monitor greater agglomerate area due to different population/build up density, anthropogenic activities and traffic. Therefore, a better reasoning is required to refer to GAA if possible at all.

Very often the authors go into unnecessary simplification and repetition, e.g. regarding temperature inversions and limited mixing. Every specialist is aware of the phenomenon and mentioning it once in detail is enough.

Minor comments:

Page 2, line 6. through emission reduction measures.

Line 9. ...toxic and carcinogenic components.

Line 12. Trace metals are also related to chronic and acute...

Line 18. ...such as traffic and industrial activities.

Line 19. since the winter 2011-2012.

Line 21. the great impact.

Line 25. Linking them to the presence

Line 33. ...has been undertaken in Southern Europe, offering challenging conditions (what is challenging there by the way?)

Page 3, line 2. the current work was focused on winter period.

Line 4. The aerosol sources during the night are not new. Rephrase to "... highlight the impact of night time PM sources".

Line 10. It is still representative of central Athens, especially during high pollution

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events during stagnant meteorological conditions. A single site cannot represent the whole GAA as suburban areas were not monitored. It is methodologically wrong to assume that a single site can serve as a reliable average of the entire GAA.

Line 13. why this word of caution when the next sentence explains everything?

Line 17. On a yearly basis, air masses of Northern origin from central and eastern Europe account for almost two thirds of the time.

Line 20. Ventilation is a poor term. You should be stating about stagnant conditions during which most severe pollution events have been occurred persisted for X % of time.

Line 28. Unclear. Were the 447 samples in addition to 848 samples or a fraction of them?

Line 30. Controlled RH=%?? conditions. Please specify.

Page 4, line 17. ...in detail by Theodosi. . .

Line 26. Not contrast, but patterns, as no one can know in advance if they will contrast.

Line 27. trivial repetitive sentence.

Page 5, line 9. unclear - combined OR night-day?

Line 27. Was it really lower limit at 0.3ug/m³ which is inconceivably low for urban PM_{2.5} concentration. Was it realistic and how did it compare to chemical mass?

Page 6, line 8. zero OC or EC cannot be observed anywhere on Earth (even in Antarctica there is observable BC of ~1ng/m³). Refer to below DL of Xug/m³.

Line 10. To be mathematically correct one should only present the arithmetic average if data are normally distributed in which case arithmetic average and median are closely similar number. We don't see that therefore data are lognormally distributed in which case the range and the median should be presented only. It has to be consistently

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presented either median alone or ALWAYS with the median, rather than selectively presenting median.

Line 26. Excellent agreement should not be necessarily expected, "results were in close agreement". Close agreement suggests long-range transport as the main source.

Page 7, line 17. remained within the same order of magnitude between studies with only slight differences in between. Chemical mass closure. Given that all major and minor particulate matter species were measured, the chemical mass closure has been attempted. However, given the large uncertainty in OM/OC ratio and no data for the current study, how useful the chemical closure exercise was?

Page 8, lin 19. Could further limit dispersion of pollutants.

Line 31. 289 days with smog conditions ...

Page 9, line 29. No statistically significant seasonality can be seen in SO₄ time series considering error bars. Note the lowest concentrations in November-December 2014. Rewrite as the text is not reflecting the Figure.

Page 10, line 4. What is the anthropogenic source of SO₄ during summer if long-range transport is blamed? Is it not biogenic (Mediterranean DMS) instead?

Page 11, line 3. ...suggesting insignificant influence from wood burning. Is it impossible that fraction of Na increase is due to higher primary in winter?

Page 12. 3.4.4a Crustal elements

Line 26. Present in tailpipe emissions, not included.

Page 14. Lines 31-34. Reword – confusion with mean annual contributions and “such large wintertime contributions”.

Page 15, line 13. What is the reason for heavy duty vehicles in central Athens?

Line 23. westerly advections, not flows.

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Line 28. there is no information whether particles were internally or externally mixed.
And even if known there is no sulphate particle in existence.

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2018.