

Interactive comment on “Three-year ground based measurements of Aerosol Optical Depth over the Eastern Mediterranean: the urban environment of Athens” by E. Gerasopoulos et al.

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The large amount of data recorded over Athens (3-yr measurements) allows here a deep analysis of the factors controlling AOD (seasonal/diurnal pattern, contributing source regions, fine/coarse modes ...). In that sense, this paper brings a substantial contribution (mainly in terms of new data) that merits publication. This paper is very well organized and well written. Scientific discussion is well sounded and convincing.

Please find below some minor comments that should be taken into account in the revised manuscript.

Page 2876, Line 10 : You can also add the role of anthropogenic sulfate aerosols and
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its major impact on aerosol optical properties in E. Mediterranean (Sciare et al., 2005).

Page 28278, section 3.1: Few words could be added on the calibration check/stability over the 3 year period as well as on the uncertainties associated with AOD retrievals

Page 28280, section 2.3.3: The cluster analysis is based on air masses backtrajectory arriving at an altitude of 1,500m which is considered here as representative of aerosol transport in the free troposphere. This choice may be adequate to properly capture any long range transport of dust aerosols. What's about anthropogenic aerosols which are preferentially transported in the boundary layer? This may alter some conclusions latter in the text. To which extent? (Table 2 & cluster analysis). Please provide arguments here.

Page 28281, line 10: The newly established “Athens-NOA” AERONET station has been operating uninterrupted since February 2009 and constitutes the continuation of these measurements at the same site. Could you briefly compare the 2 datasets (at least on a seasonally /yearly perspective)? The fact that similar (seasonal) pattern (AOD and angstrom exponent) are observed between these 2 datasets may strengthen the results (representativeness) reported here.

Page 28282, section 3.2: The aim of this section is to investigate the role of local (urban) emissions and local transport pattern. Sea breeze may play a role here with advection of coarse (sea salt) particles. No ? Can the diurnal variability of relative humidity (i.e. liquid water content onto sulfate aerosols) play a role here? Is there any PM data available in the region of Athens (Air quality network) to validate AOD diurnal variations? Diurnal variations are presented here for each season but with no distinction of air masses origin (which is discussed later in section 3.3). Is there sufficient amount of data from the 5 classes (cluster analysis) to investigate their corresponding AOD diurnal variation? Long range transport would likely exhibit poor diurnal variations whereas local emissions (class 5?) may exhibit larger variations.

Page 28284, section 3.3: This part of the manuscript is particularly interesting as it

brings new insights on the regions contributing to AOD above Athens. Although the contribution of local emissions cannot be removed from each of the classes investigated here (unless you apply a constant AOD of 0.1?), it would be interesting to perform a class-based source apportionment of the AOD (i.e. % contribution of each class to the 0.23 yearly average AOD).

Another point here. Is there enough data to investigate the year-to-year variability of the 5 classes?

Page 28285, line 5: The fact that the fast trajectories bring lower AOD may also reflect that higher ventilation (i.e. higher dilution of pollution aerosols) of W. European anthropogenic emissions is expected to bring lower AOD.

Page 28286, line 8: To support the major role of long range transported biomass burning over Greece (double maximum around spring and later summer), you can also refer to Sciare et al. (ACP, 2009) who have shown, from multi-year record, the major role of biomass burning aerosols in the E. Mediterranean and their impact on aerosol optical properties.

Page 28288, section 3.3.5. It is hard to believe that stagnant conditions (low wind speed) will bring high levels of sea salts above Athens. Local dust at ground level (resuspension, . . .) or stagnant dust layers in altitude may be better candidate for the observed low angstrom exponent.

Page 28288, section 3.4: The agreement between MFR and MODIS is quite significant showing the consistency of both datasets. Still little explanations are given here to explain why MODIS provides higher AOD during summer? This period is characterized by northern flow (anthropogenic/wood burning). Any idea? The comparison between the 2 datasets (MFR & MODIS) is performed using solely the regression analysis tool. Can you provide more information on this comparison (sample-to-sample comparison and subsequent bias)?

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Page 28291, line 21: What does mean exactly the end of the sentence “. . . degradation of regional quality”. Do you mean degradation of air quality at regional scale? If so, I am not sure that AOD is the best indicator for that.

Figure 4: The data are restrained to 1400 UTC. During summer, you may have larger amount of data which may help to better cover the diurnal pattern of AOD and Angstrom exponent. It may be worth to add this data in the Figure.

Figure 6: Please provide the number of valid points used for the comparison.

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