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Atmospheric Chemistry and Physics Discussions

Interactive comment on "High spatial resolution aerosol retrievals used for daily particulate matter monitoring over Po valley, northern Italy" *by* B. Arvani et al.

Anonymous Referee #1

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In the following some observations written following the scheme of the paper

–> ABSTRACT -

** why relating AOD at 550 nm to PM10 and not to PM2.5? a discussion on this issue in particular with respect to the size particles compared to the incident wavelength, that is on the variation of the Mie scattering/extinction efficiency as a function of the particle's dimensione would have been proper, maybe in the paragraph where the defintion of AOD is presented.

geographical domain of the study is the Po valley and the time period is whole 2012

** annual correlation the correlation is not taking into account seasonal ot monthly behaviour of the investigated phenomenon (e.g. of the mixing layer) and also all the sampling sites located within the domain are mixed: the different kind of particles in the different areas of the domain of interest (i.e. rural, industrial . . .) is neglected

No reference to any relationship between AOD and PM upon which the introduction of the mixing layer height as a normalizing factor is given. The fact that the correlation increases using the normalizing factor is not enough a reference to a method, to a theory should be mentioned and in the following, in a dedicated paragraph, discussed.

–> 1. -Introduction

the authors underline the importance of the improved spatial resolution of AOD products from 10 to 1 km - on which one completely agrees - but this is then in constrast with the use of meteorological information at the resolution of 0.5 x 0.5 degree which at the latitude of the domain of interest is approximately 55 km

Don't the authors think that it would have been appropriate to fuse meteorological and satellite-derived information of the same order resolution? How the integration of information at 1km resolution and at 55 km resolution could provide a reliable information in output? A sensitivity analysis on this has been previousy performed? In this case, the results should be presented and If not, it would be highly recommended. Fusing data of so different spatial scale [data coming from different sources (simulations and satellite retrieval) and describing spatially highly variable phenomena] could mask behaviours in the AOD to PM relationship which cannot be distinguished in this way.

–> 2 - Data and Methods - Fig1 - in the figure legend the acquisition time of the MODIS/Aqua data could be mentioned

2.1 PM10 measurement sites and methods

In this section, it could have been mentioned as a reference method the gravimetric technique for measuring PM concentration.

Moreover also a discussion should be inserted on how the authors have considered the problems related to the comparison of a dry measure of the PM with respect to the atmospheric-condition of the AOD satellite estimates

–> 2.3 fusing meteo and satellite derived data is the satellite acquisition-time parameter considered? and how? with respect to the satellite overpass hour, which hour of meteorological analysis has been chosen? isn't the mixing layer height varying during the 6 hours considered? within this frame, it should be taken also into account that the satellites derived information could reach the spatial resolution of 1km.

–> 2.4

The comparison between mixing layer height (Hmix) derived from GDAS and CALIPSO liar measurements is interesting. Since different studies have been published on the comparison of simulated Hmix and measured Hmix a reference could be introduced here to better understand the behaviour of the GDAS values. Actually, different approximation are employed to calculate mixing layer height in a meteorological model, and several methods used to retrieve Hmix from lidar measurements. which definitions and methods have been chosen and then employed here, and how these choices affect the results?

–> 3.1 - Aeronet AOD validation it could be interesting here mentioning the values provided by the aeronet validation made by the official MODIS nasa team and discussing similarities and/or discrepancies

–> 3.2 - Time series analysis

the PM10 monthly mean has been calculated for all the 126 stations toghether - no values of the standard deviations has been reported in the graphics or written in the dedicated text neither for PM10 or AOD

this parameter can provide significant information concerning parameters as AOD or PM small values of the standard deviation (w.r. to the mean value) could suggest that

phenomena is not varying in the time-period considered, on the other hand, values of the standard deviation of the same order of the mean value could suggest that the phenomena is highly variable in the time period in analysis.

Has this kind of analysis been carried out? for example also trying to figure out if similarities exists among subsets of the overall 127 sites set.

the only one parameter discussed here is the method employed to carry out the co-location with the results that no appreciable difference between the two-colocation methods.

–> 3.3

in grouping the pm data only on the basis of the concentration values some information concerning aersol type (anthropic/natural, mixed . . .) , seasonality , and other features as hygroscopic behaviour and meterological conditions of the domain are completely neglected any analysis concering these features have been previously performed? with which results?

–> conclusion

The published results can be already found in literature, in several papers, not only on this preliminary relationship between AOD and PM but also in the same geographical domain, with very similar results. Authors should, at least, mention them. Furthermore, no significantly new elements are here introduced with respect to literature on the use of satellite derived aerosol information for monitoring PM at the surface. Actually, the work here presented would have been enriched with sensitivities analysis concerning the spatial resolution of the different kind of information fused together.

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 123, 2015.