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Atmospheric Measurement Techniques Discussions

Interactive comment on "Comparison of the aerosol optical properties and size distribution retrieved by Sun photometer with in-situ measurements at mid-latitude" *by* Aurélien Chauvigné et al.

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First, authors would like to thanks both reviewers to their time and to bring interesting comments on scientific contributions to the paper. We answer below point by point to these comments and to raised questions:

RC1 : A set of papers presents analysis of correlation between parameters of aerosol particles received from in-situ measurements at the ground-based sites or at meteorological towers and the results of columnar or altitude- resolved remote sensing data. Nevertheless, this multiple-factor problem remains relevant for interpreting data of com-

plex atmospheric experiments. The manuscript by Chauvigné et al presents novel results for characterization of this problem because of uniqueness of the database gathered at the PUY atmospheric station. The authors analyze the results of long-term in-situ meteorological, aerosol optical and microphysical observations at two sites with altitude 0.4 and 1.4 km, as well as data of lidar and sun-radiometer measurements. Depending on meteorological conditions, the upper site of in-situ measurements was located either within mixing layer, or in free troposphere which allows the different variants of aerosol investigations to be considered. Paper can be recommended for publication. List of specific comments:

Page 8, Line 18, 19: Remove "Error! Reference source not found" and correct the text.

Authors :

The Figure has been removed and thus the referencing text.

Discussion, page 9, line 14: Reference removed.

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RC1 : Page 8, Line 26: It is appropriate to note that results of in-situ measurements in the ground-based layer are affected by local aerosol sources. Measurement conditions at the high altitude Puy de Dôme site eliminate such interferences.

Authors :

Indeed, the high altitude site is not affected by local pollution, while it might have been the case at the ground-based site in the study by Bergin et al., (2000). We modified the sentence:

Discussion, page 9, line 23: "This result might be explained by a better representativeness of the atmospheric column by high altitude in-situ measurements, that are usually representative of a large spatial area (Henne et al., 2010) and less affected by eventual local contaminations than ground-based low altitude sites might be. "

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RC1 : Figure 7 and 8: what means Diameter? (mode, median . . ..of fine/coarse particle volume distribution ?

Authors :

These are diameters obtained after the fitting procedure of the volume size distribution: we mean modal diameters.

Figure 7 legend: “Scatter plot of fine and coarse mode modal diameters, and volume concentrations after applying the ML and FT contribution factors to Sun Photometer concentrations. Blue fit and markers are for FT data and red fit and markers for ML data.”

Figure 8 legend: “Scatter plot of fine and coarse mode modal diameters, and volume concentrations after applying the Humidity growth factor (HGF). Color corresponds to the mean relative humidity between the two stations. Blue fit and cross markers are for FT data and red fit and circle markers for ML data.”

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RC1 : Part 5.2 The significant difference between “in-situ and Sun-photometer diameters” of fine particles is a very interesting result. Do authors have a physical interpretation of this feature?

Authors :

Difference of particle diameters between the two measurement techniques can be explain mainly by a vertical gradient of aerosol diameters within the atmosphere and by different vertical transport processes.

Discussion, page 13, line 13: “However, a vertical gradient of aerosol diameters might explain this feature. Liu et al. (2009) have analyzed higher effective radii at high altitude than at ground level from an aircraft study above Beijing region. Indeed, large

aerosols are transported more efficiently over large distances when they are transported at higher wind speeds, which are prevailing at high altitudes.”

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