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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.

Anonymous Referee #3

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This manuscript refers to studies analyzing the results of comprahansive aerosol experiments. The authors present the data of long-term in-situ aerosol optical and microphysical observations at PUY atmospheric station (1465 m a.s.l.), as well as data of lidar and sun-radiometer measurements at Cezeaux University Campus site (410 m a.s.l).

List of comments is given below.

1. The paper reports the results of the comparison of the aerosol optical and microstructural characteristics in the atmospheric column and at altitude where the

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PUY site is located. At PUY site aerosol light absorption (σabs) and scattering (σscat) coefficients are measured using a Multi Angles Absorption photometer and a three wavelengths nephelometer respectively. Similar equipment is installed on the aircraft to provide vertical profiles σabs(z), σscat(z) and extinction coefficient σext(z)=σabs(z)+σscat(z). The analysis of measurements of aerosol characteristics in the atmospheric column and their vertical profiles obtained on board of aircraft is presented in a number of studies (see **). Several papers also discusses the effect of relative humidity on the absorption σabs(z) and scattering σscat(z) coefficients. This manuscript does not consider the vertical profiles of the extinction coefficient, however, some approaches and results (** and others) logical to use in current study. Is possible it will be useful in the interpretation of data and help to explain the significant difference between in-situ and Sun-photometer measurements. The above also applies to the particle size distribution function.

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2. It is known that data from in situ measurements of the absorption and scattering coefficients are characterized by relatively high degree of uncertainty. I think it is advisable to consider the influence of these factors when carrying out comparisons (including PSDs).

3. The authors compare in situ extinction coefficient and the average aerosol extinction as AOD contained in ML : σSun ptotometer=AODSun photometer/MLH. Why do the authors have chosen namely this characteristic? After filtering of the multilayer cases the extinction coefficient decreases with height. It can be assumed that the decrease is described by an exponential or linear law. It is possible that for this class of atmospheric situations can be used not average value and it will be more physically substantiated.

4. It seems to me that it is necessary to write more clearly what atmospheric situations belong to the ML cases and what – to FT cĐřses.

5. Page 5: “A CIMEL Sun photometer (CE-318), operating at the CZ site, measures the aerosol optical properties of the total integrated atmospheric column under ambient conditions at four wavelengths (440, 675, 870 and 1020 nm)”. The measurements of the diffuse radiation at these wavelengths provide a solution of the inverse problem (retrieval of phase scattering function and single scattering albedo, refractive index, particle size distribution function). AOD is also the optical characteristic, but AOD measurements is performed on the extended set of wavelength.

The way of presenting the results in this version of the manuscript has largely descriptive character (5% more than . . ., the correlation coefficient is equal to ...). I think the text needs refinement: the article will be more interesting if it will be supplemented by

an more detailed analysis of the causes that led to the presented above results.

Please also note the supplement to this comment:
http://www.atmos-meas-tech-discuss.net/amt-2016-97/amt-2016-97-RC2-supplement.pdf

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