

Interactive comment on “Comparisons of spectral aerosol absorption in Seoul, South Korea” by Jungbin Mok et al.

Anonymous Referee #3

Received and published: 6 February 2018

GENERAL COMMENTS

The paper by Mok et al. focuses on the comparison of aerosol single scattering albedo (SSA) retrieved by SKYNET (POM-02) and by a combination of instruments (AERONET, MFRSR and Pandora). The broad spectral range, including the ultraviolet band, covered by the comparison make this study original. Surface albedo is found to be one of the main sources of discrepancy (underestimation) in SKYNET compared to AMP.

The paper covers a very interesting research topic and is generally well written. I recommend the publication on AMT after addressing the following minor issues.

SPECIFIC COMMENTS

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I have two remarks about the internal consistency of AMP retrievals.

1. Equation 1: in principle, to preserve consistency within the AMP triad, the gaseous optical depths used in MFRSR retrievals (τ_R , τ_{NO_2} and τ_{O_3}), included in the right-hand side of Eq. 1, should be the same as the ones used by AERONET for the retrieval of the aerosol optical depth (τ_a) from the measurements of total optical atmospheric depth. Otherwise, slight differences in NO_2 or O_3 concentrations, pressure or used cross-sections could introduce some noise or fictitious biases (especially in the UV-VIS part of the spectrum). Can you discuss this point?

2. At page 7, the authors affirm that PDS retrievals from AERONET (which accounts for non-spherical aerosols) are used to calculate SSA from MFRSR assuming spherical particles. Isn't it an inconsistency? The authors should explain that most aerosol are spherical at the measuring site or that non-spherical aerosol were excluded from the analysis (e.g., based on some AERONET output parameters).

On a different note, do the authors have an explanation why they do not find the SSA overestimation as the previous studies at VIS and IR ranges? Since emphasis is laid on this contrast with the previous literature (e.g., page 10 l. 4-5 and l. 21-23), some explanations should be provided.

Finally, I would suggest to expand the conclusions, e.g. by including a special remark for terrains covered by snow and recommendations on how to determine the optimal surface albedo to be used in SKYNET inversions if no other co-located instrument is available at a specified measuring station.

TECHNICAL CORRECTIONS

page 1 title: the title refers to "spectral aerosol absorption" without mentioning explicitly the "single scattering albedo", which is the main topic of the paper and the only physical quantity provided as a result (apart from AOD and Angstrom exponent). I would suggest to change the title accordingly and not to mention in the abstract the quantities

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that are not directly discussed in the paper (column effective imaginary refractive index (k) and aerosol absorption optical depth (AAOD));

page 2 l. 1-16: this first paragraph puts together too many topics that should be dealt with separately (radiative effects - consisting in scattering and absorption (not only absorption), health effects, photochemical smog, etc.). The result is a bit confusing for the reader and somehow disconnected from the main topic of the paper. I would suggest to rewrite this whole paragraph;

page 2 l. 15: "in the UV remain one of the most difficult tasks..." -> this is a key point. Explain why it is a difficult task;

page 3 l. 23: "equipped with" -> "mounted on" or "fitted to";

page 5 Eq. 1: the equation should be introduced by a sentence;

page 5 l. 29: "second order polynomial interpolation/extrapolation least-squares fit in logarithmic space..." -> replace this complex sentence with a formula;

page 5 l. 31: "a Pandora" -> "Pandora";

page 6 l. 3: "from the OMI" -> include a link to the data or explain which product was used;

page 6 l. 32: "either from MFRSR... or AERONET" -> explain how either one or the other quantity is chosen;

page 7 l. 23: "the static calibration" -> "the so-called static calibration";

page 7 l. 25: "use dynamic ... method" -> "use the dynamic ... method";

page 7 l. 27-28: "during very hot summer" -> does this mean that the agreement is better in the cold season because of lower temperature? Also, I do not understand how the daily temperature variations (line 27) can be taken into account using a two-month average period (page 8);

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page 8 l. 1-2: "to minimize the temporal stability" -> "to account for the temporal variability" ? "consider the consistency with the above-mentioned static calibration constants" -> what do you mean? Could you rephrase?

page 8 l. 6: "the known field of view of the instrument" -> this seems to be a key point from previous literature. Could you explain what method you used to determine the FOV?

page 8 l. 21: "UV- and VIS-MFRSR retrieved SSA at 440 nm" -> "SSA retrieved at 440 nm by the UV- and VIS-MFRSR instruments";

page 9 l. 14: "Comparing" -> "Compared to the";

page 9 l. 20: "NO₂ that is not completely accounted for in the AERONET retrievals" -> explain why;

page 10 l. 18-23: are these lines a typo? They are a repetition of the previous paragraph;

page 11 l. 12: "significantly increases the SSA (by 0.01)" -> how can a 0.01 increase be defined "significant"? Same at line 15: "significantly";

page 11 l. 19: "is a critical pre-condition" -> then, since this is a pre-condition, why not move this section before the SSA discussion?

page 11 l. 28-29: "gaseous absorption ... not taken into account in the sky radiances ... inverted in the AERONET Version 2 retrievals" -> could you add a bibliographic reference about this issue?

Interactive comment on Atmos. Meas. Tech. Discuss., doi:10.5194/amt-2017-380, 2017.

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