

***Interactive comment on “Hygroscopic growth study in the framework of EARLINET during the SLOPE I campaign: synergy of remote sensing and in-situ instrumentation” by Andrés E. Bedoya-Velásquez et al.***

**Anonymous Referee #2**

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The manuscript “Hygroscopic growth study in the framework of EARLINET during the SLOPE I campaign: synergy of remote sensing and in-situ instrumentation” focuses on the aerosol hygroscopic properties as inferred from remote sensing instrumentation. The advantage of such a system is that the aerosol particles are measured directly as they are in the atmosphere without the need of any pre- or aftertreatment. In this particular study the shortcomings of traditional collated radio sounding (RS) measurements, suffering from low temporal resolution, are overcome by using a Raman lidar to measure water vapor mixing ratio profiles combined with a microwave radiometer to

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retrieve temperature profiles. Additionally, a comparison was performed with RS measurements and in-situ data recorded at a thigh altitude station in the Sierra Nevada. I recommend the paper for publication in ACP after the following comments have been addressed:

Major comment:

In general, the paper presents an interesting study comparing direct measurements at different elevations with in-situ data at a nearby located mountain site. There is however a lack of information on the in-situ data. Did the ACSM and Aethalometer have a specific inlet (PM<sub>10</sub>, PM<sub>1</sub>...)? Did they share an inlet? What was the mean or median size distribution during the selected case studies? Did the APS see particles above 2-3  $\mu\text{m}$ , which is mentioned to be the upper limit of the Lidar? Can dust particles be excluded during the case studies (which could lead to a lower backscatter coefficient but cannot be measured by either ACSM or Aethalometer)? It is mentioned that it is difficult to assess the uncertainties in the in-situ data, but can any upper or lower limits be estimated? Also, the size at which the hygroscopic growth factors listed in Table 1 were measured should be mentioned and a short comment on the mean/median size measured during the cases in this study should be added. Additionally, the introduction would profit from some information on the used method to retrieve in-situ hygroscopicity values (more comments on this are presented later).

General comments:

P2, line 30: Please make the section on commonly used hygroscopicity measurements clearer. The HTDMA has only been employed on the ground, whereas there are other instruments for airborne measurements (DASH-SP, WHOPS, AMS+Aethalometer...). Also add some information on the method used in this article and some pros and cons as stated for the HTDMA.

P6, line 6: Please add if any corrections were applied to the Aethalometer data and which MAC value was used to convert the absorption coefficient to the eBC concentra-

tions (and reference). Figures: Please use the descriptions of a) b) c) ... in the text to refer to certain parts of the figures as this facilitates to follow the discussion. Also add legends to Figure 1 and mention what the  $\gamma$  values given in the legends are (the text states only “solid lines”).

Title of section 4.2.2: “measured and modelled  $f_{\beta\lambda}(\text{RH})$ ” is a little misleading as no modelling (except HYSPLIT) was performed. Maybe rather use “measured  $f_{\beta\lambda}(\text{RH})$  and calculated using in-situ data and Mie theory” or something similar.

Figure 5: The “measured” data exhibits some kind of jump at  $\text{RH}=95\%$ . Can you comment on this and why, possibly, it is not seen in the Mie calculations with the in-situ data?

Specific comments:

P3, line 26: change “on one hand” to “on the one hand”

P4, line 5 and following: please rephrase the second part of the sentence with the case of  $\text{RH}>60\%$

P4, line 23: please specify “incomplete overlap”

P6, line 6: change “werer” to “were”

P7, line 18: which GDAS resolution (degrees) was used?

P13, line 6: missing space between “similar” and “ $\gamma$ ”

P13, line 8: change to “in one of their case studies”

P13, line 24: what does the 4% refer to exactly?

P13, line 29: change to “associated with...”

P13, line 31: change to “reported in..”

P14, line 22: use past tense i.e. “were” instead of “are”

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P14, line 28: change “it is concluded” to “we concluded”

P15, line 5: change “gamma parameter” to “ $\gamma$  parameter”

P15, line 6: please add a more precise description of what the 13% and 10% describe

P15, line 7: change “those” to “these”

P15, line 7-8: explain what “favorable” means; change “no-advection” to “in absence of advected air masses” or something similar

P15, line 11: change to “making it possible”

P15, line 12: change “those” to “these” or “such”

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Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2017-993>, 2017.

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