

## ***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 high 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 (PM10, PM1...)? 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-

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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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