

Interactive comment on “Spatial variation of aerosol optical properties around the high-alpine site Jungfraujoch (3580 m a.s.l.)” by P. Zieger et al.

Anonymous Referee #1

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The paper reports on a closure experiment in a high-alpine region by using in-situ instrumentation as well as lidar and passive remote sensors. The in-situ instruments were placed at the research station Jungfraujoch whereas the lidar was located about 2000 m below and could scan towards the Jungfraujoch. Therefore, all systems could practically sense the same air masses. Thus local closure studies could be performed and are well justified. The paper is well written and logically structured. The instrumentation is introduced in necessary detail. The results are carefully discussed considering meteorological conditions and measurement errors. Some minor issues, which should be considered in the revision of the paper, are listed below.

Introduction, last paragraph: References should be added for more recent aerosol closure studies.

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Page 11110, line 17: explain FUBISS (seems to be the place of first appearance here)

Page 11114-11115, eq. (3) and (4): use of indices is somewhat strange, what is the physical meaning of index ϵ_p (extinction by particles) for the backscatter coefficient? Why do you switch to aer for L ?

Page 11115, line 13: aerosol size -> particle size (the term aerosol usually describes a suspension of particles in air)

Page 11115, line 20: lidar inversion is usually performed following Fernald (1984)?

Page 11116, eq. (6): this equation is incorrect; the depolarization ratio can only be determined by considering a calibration factor. Please describe how the calibration is performed and whether you mean volume or particle depolarization.

Page 11116, line 5: “The lidar was measured...” ?

Page 11117, eq. (7): avoid to mix up abbreviations (here AOD) and variable names (here τ) in equations

Page 11118, line 14/15: “It allows to estimate the observed aerosol type, ...” What does aerosol type mean in this context? As the Angström exponent also aui should primarily depend on particle size.

Page 11123, line 20: refractive index of dust taken from Hess et al. (1998) – there should be better values available meanwhile (check, e.g., Kandler et al., Tellus 61B, 32-50, 2009)

Page 11124, first paragraph, discussion of Fig. 3: There is not only a discrepancy for the blue curve, but also for the red one (no Saharan dust). Could you discuss the reasons?

Page 11126, line 14: wind direction – only horizontally or also vertically (upwind/downwind)?

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Page 11130, line 21: measures -> measure?

Page 11131, line 11: values smoothly increases and recovers - > values smoothly increase and recover

Page 11131, line 24: allows to determine -> allow the determination of

Page 11132, line 10: where -> were

Page 11145, Fig. 4: units for LR are missing

Page 11146, Fig. 5: I cannot distinguish the different symbols/colors (especially in panels a and e). Can this plot be improved? In panel a, are these red bullets (caption) or crosses (legend)?

Page 11147, Fig. 6: LR = 65 sr (legend) or 75 sr (caption)?

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