

Interactive comment on “Radiation fog formation alerts using attenuated backscatter power from automatic Lidars and ceilometers” by Martial Haeffelin et al.

Anonymous Referee #2

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GENERAL COMMENTS

This manuscript presents a practical method for providing fog alerts from routine measurements that will be of major benefit to society. The study takes a pragmatic approach suitable for routine measurements, together with excellent analysis, and demonstrates applicability to real cases. The manuscript provides a clear methodology that can potentially be objectively applied to numerous sites across the globe. I believe this paper is ready for publication after a few very minor modifications.

The method understandably uses threshold values for some of the alerts. A quick discussion on how sensitive the method is to the choice of threshold values would be very useful; the authors already note that the method will probably require some tuning

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at different locations. The method also assumes homogeneous aerosol properties; there may be locations where this assumption may not be so reliable, could the authors elaborate a little on the likely impact in terms of fog alerts?

Fog is a rare event, so I assume it is better to have some 'false alarms' rather than any 'misses'.

It should also be noted that this method requires ALCs that have full overlap already at quite low altitudes so that reliable attenuated backscatter values are available from 50 m or so in height. This is a major implication in terms of instrument selection.

SPECIFIC COMMENTS

Page 1, line 26: I suggest that you start this sentence with 'We find that an alert for pre-fog conditions predominantly occurs ..'

Page 2, line 1: Replace 'sensitive to relative humidity' with 'sensitive to the relative humidity'.

Page 3, line 3: I suggest that you replace 'formation of a liquid layer near the ground' with 'formation of a layer containing liquid water droplets near the ground'.

Page 3, lines 7-8: Replace 'air traffic in the' with 'air traffic over the'.

Page 3, line 21: Replace 'scores' with 'skill scores'.

Page 4, line 10: Here and elsewhere, replace 'could' with 'can'.

Page 5, line 3: Replace 'are' with 'have been'.

Page 5, line 10: Table 1 states 910 nm, as do the manuals. Also page 16, line 17.

Page 6, line 1: Replace 'size' with 'sizes'.

Page 6, lines 2,3: Suggest that you state 'relatively low SNR' as the latest CL51 instrument usually exhibits high SNR in the boundary layer at night.

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Page 6, line 24: Suggest replacing 'for bi-axial ALCs full overlap can be reached' with 'for bi-axial A LCs full overlap can only be reached'.

Page 7, lines 9, 10, 11, 13 (and elsewhere): Remove the indefinite article 'a' when referring to fog. Also, do not use the plural 'fogs' on line 11.

Page 7, lines 7-9,11: Use 'vertically-developed' and 'quasi-radiation'.

Page 7, lines 11-12: I suggest that you combine these two sentences otherwise it could be read as saying that all fog is due to inactivated haze particles.

Page 8, lines 14, 15: The real part of the refractive index may be lower for pure water than aerosol; here you are dealing with a mixture of water and aerosol and it is the relative change in the amount of water in the droplet that changes the refractive index. Note that the imaginary part of the refractive index is small but not zero for pure water, and that this also varies with wavelength.

Page 9, line 12: Replace 'properties as' with 'properties such as'.

Page 9, line 14: Replace 'describe that' with 'assume that'.

Page 10, line 16: Replace 'follow' with 'follows'.

Page 10, line 18: Replace 'dividing' with 'by dividing'.

Page 10, line 20: Replace 'in periods' with 'over periods'. Is there a suitable reference showing the instrument calibration stability (i.e. that the calibration factor and the overlap function are stable)?

%%%Page 13, line 10: Replace 'had' with 'has'.

Page 16, line 9: Should this be attenuated backscatter?

Page 17, lines 16, 21 and elsewhere (page 21): Suggest using 'm hr⁻¹' rather than 'm/h'.

Page 18, line 4: Replace 'alert' with 'alerts'.

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Page 19, line 2; Replace 'moistest' with 'most moist'.

Page 22, line 11: Replace 'pre fog' with 'pre-fog'.

Table 1: Full optical overlap for CL51 much lower than the 500 m stated here. You could include temporal resolution in this table.

Figure 3: There is a slight departure from the fit between 75% and 85% which looks like hysteresis in the aerosol response to RH - is this during the increase in RH or decrease?

Figure 5: Replace 'time series' with 'Time series'.

Figures 6, 7: Note somewhere in the caption that white is at either end of the colour scale (noise and cloud), or fill cloud (> 1e-4 m⁻¹ sr⁻¹) with some colour.

Figures 6-9: In panel b, the colour for the line at the top of the panel (PARAFOG status?) is not described in the caption. What do you mean by 'Pre-fog conditions are clear'? Clear skies?

Figure 11: It would be easier to read this figure if the colour scale was separate from the plot panels.

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