Atmos. Meas. Tech. Discuss.,
doi:10.5194/amt-2018-427-RC2, 2019

Atmospheric Measurement Techniques
Discussions
Open Access
EGU

Interactive comment on "A robust automated technique for operational calibration of ceilometers using the integrated backscatter from totally attenuating liquid clouds" *by* Emma Hopkin et al.

Anonymous Referee #2

Received and published: 7 February 2019

This manuscript presents a methodology for calibrating ceilometers automatically. Although the calibration technique itself is not new, the methodology has been significantly improved so that it accounts for additional sources of error and bias, and demonstrates that it can be applied to more than one type of ceilometer. The methodology has also been extended to be suitable for adoption across a large-scale network, crucial for enabling reliable data production operationally, and also shows the typical performance across a network.

I recommend that this manuscript is suitable for publication after some minor revisions

Printer-friendly version

Discussion paper

to clarify some small details.

Specific Comments

Abstract, lines 16-19: Vaisala ceilometers in operational use are often set so that not all signal above 2.4 km has been range-corrected; should you add here a maximum cloud altitude of 2.4 km?

Abstract, line 28: It's not clear which instrument you are referring to, and whether you mean a minimum threshold altitude of 2 km.

Page 2, line 46: It is possible to operate these instruments with 5 m resolution..

Page 3, lines 105-107. This statement is not quite true. It is often preferable to operate at as high a pulse repetition rate as possible in order to increase sensitivity; the limitation is also determined by expected sensitivity in terms of avoiding 'second-trip' echos. For low-powered ceilometer systems, you may not expect to obtain any signals above 15 km even after averaging, hence a high repetition rate of 10 kHz is suitable, whereas high-powered lidar systems are capable of detecting polar stratospheric clouds at 15-25 km, or designed for observing other atmospheric parameters in the stratosphere-mesosphere, and require a lower repetition rate. It may also depend on the detector.

Page 3, line 111, and Table 1: Maximum range of CL31 in standard mode is 7.7 km (770 gates with 10 m vertical resolution, 385 gates with 20 m vertical resolution). If operated at 5 m vertical resolution then maximum range is 7.5 km (1500 gates).

Page 4, line 116: Not airline pilots, but aviation forecasters and air traffic control!

Page 4, lines 136-137: The O'Connor et al. (2004) paper shows that S is constant for droplet size distributions with median volume diameters in the range of 10 to 50 um and states that it starts to fall for distributions with median volume diameters above 50 um.

Page 8, lines 260-261: Do you mean ' at a wavelength of about 910 nm '?

Page 8, line 270 & 273: Suggest that you include NWP or operational forecast, i.e. 'a convection-permitting variable resolution regional NWP model' and 'ECMWF operational forecast model'.

Page 8, lines 276-279: I suggest you expand this to explain that some signals above 2.4 km may not have been range-corrected, which is why they are not suitable.

Page 9, lines 292-302: This feature could be due to the range-dependent multiple scattering factor not being calculated correctly at close ranges (the telescope alignment not being perfect for example).

Page 10, line 340: Could add here that the method works for both coastal locations and inland.

Page 12, line 410: Unlike the Vaisala ceilometers operated in 'standard mode'. The instrument settings can be altered so that this change in processing at 2.4 km is not switched on.

Page 13, line 444: As you state later in the next sentence and the next paragraph, drizzle and and ice scattering aren't wavelength-independent, so I suggest revising this sentence.

Page 13, lines 455-457: Have you checked the impact of multiple scattering for drizzle in your comparison of the two instruments? This may explain why the best fit does not lie on the 1-to-1 line; more multiple scattering would be expected for the Vaisala instrument.

Interactive comment on Atmos. Meas. Tech. Discuss., doi:10.5194/amt-2018-427, 2019.