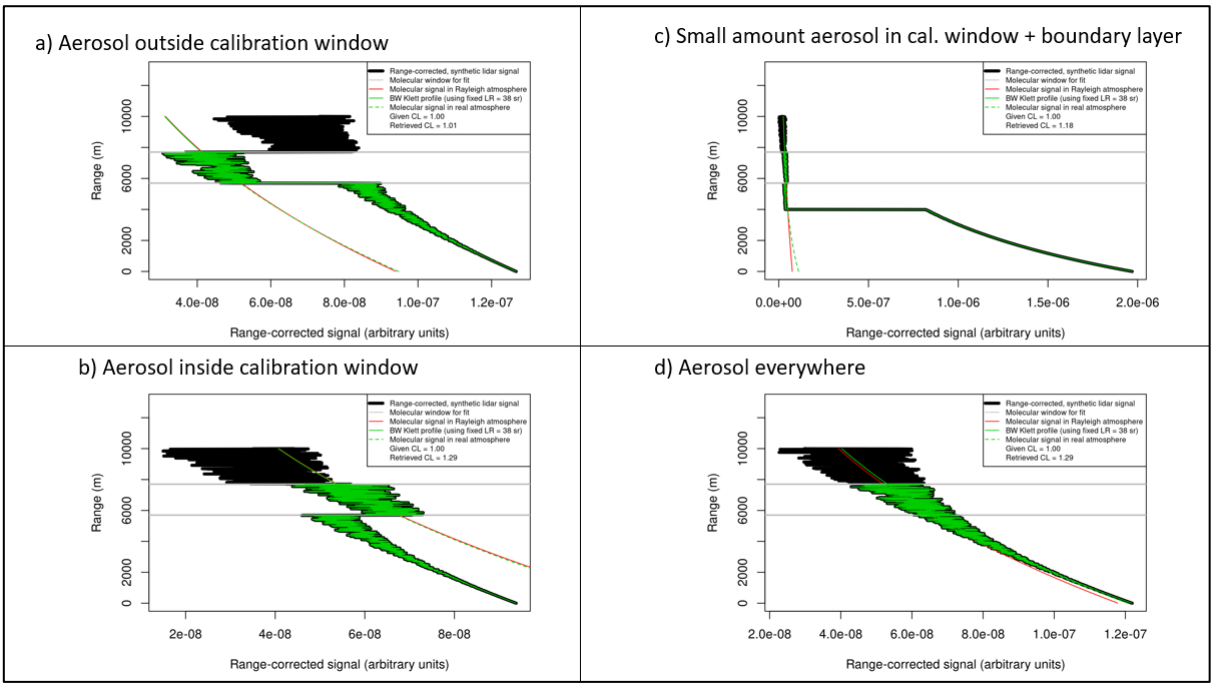
Investigating the seasonal fluctuations of the CHM15K Ceilometer calibration constant

Joelle Buxmann (Met Office), Henri Diemoz (ARPA Aosta), Francesca Barnaba (ISAC-CNR), Annachiara Bellini (ISAC-CNR), Ina Mattis (DWD), Rolf Ruefenacht (Meteo Swiss), Martin Osborne (Met Office)

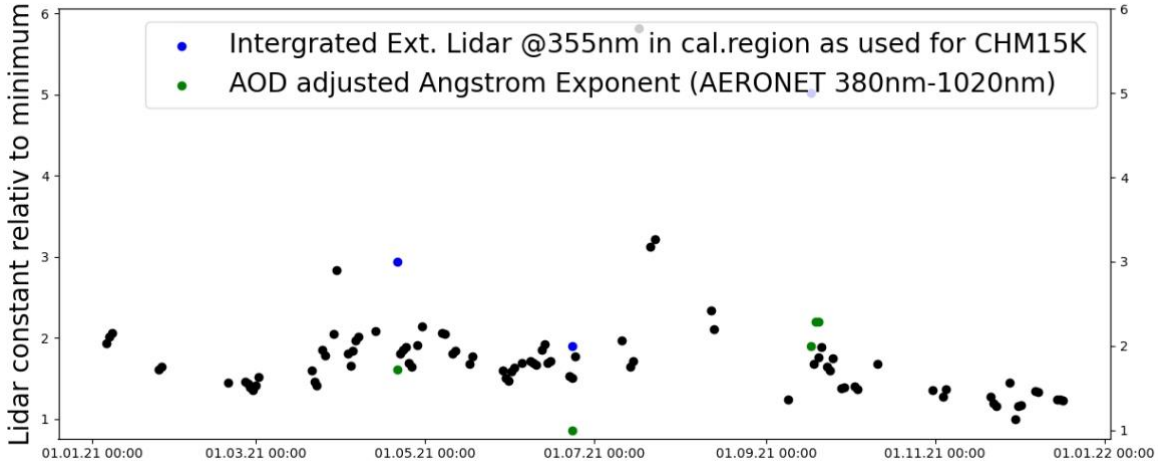
The main objective was to investigate weather the seasonality in the CHM15K ceilometer calibration constant (Lc) could be related to optically thin aerosol layers in the calibration window. The results are described as follows:

Figure 1: Synthetic Ceilometer profiles with varying amounts of aerosols.



Case a) has nearly no influence on the Lc while case b) can affect Lc significantly up to a factor of 1.3 for aerosol with AOD~0.01 at 1064nm in the calibration window. However, case b) would most likely be disregarded for calibration by the calibration retrieval. Interestingly, case c) and d) can cause a significant change in the calibration constant and possibly not be filtered out by the calibration process. The order of magnitude of 1.1 to ~3 is hugely dependent on the ratio of aerosol in the calibration window to aerosol outside the calibration window.

Figure 2: Comparison of seasonal variation of aerosol in the calibration window with Raymetrics lidars



Direct comparison of aerosol amount in the CHM15k calibration window for selected cases on coincident nights confirm thin aerosol layers detectable with the Raymetrics lidar. The AOD and further backscatter values were translated to using the AERONET Angstrom exponents for that day.

We can conclude that there are days where the CHM15K calibration is performed by the e-profile retrieval with small amounts of aerosols present. And it is theoretically possible to account for factors of up to 2-3 change in Lc. Further investigation is needed to confirm this is sufficient to explain the seasonal cycle.