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Atmospheric Measurement Techniques Discussions

Interactive comment on "Recommendations for processing atmospheric attenuated backscatter profiles from Vaisala CL31 Ceilometers" *by* Simone Kotthaus et al.

Anonymous Referee #4

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GENERAL COMMENTS

It is very good to see such a detailed description of the system, processing steps, and correction methodology. This is very helpful to the user community.

It might justify your method to look for references of how this kind of problem/filtering has been addressed generally in sensing in the past, in signal processing journals. A simple diagram and/or equation of electronics impulse response might be helpful to audiences who don't understand why this instrument noise is here. I think I've seen something like this in a reference you already mentioned, Vande Hey, 2014.

TYPOS

P2 L18: ALC? Categorized?

P2 L19: perform sophisticated cloud height algorithms-how are they sophisticated?

P4 L2: "solar insolation", Is this phrase redundant? Don't you mean something like either "solar radiation" or "background light increase due to insolation"?

P5 L29: is word "known" needed?

P10 L21-22: "...in the near range when the window is obstructed and a hardware-related perturbation." I think this is an incomplete sentence.

P11 L14: "their impact", perhaps "the impact of these artefacts"

CORRECTIONS

P5 L11: might illustrate range-dependent noise

P5 L12: nomenclature for Praw and Praw too similar? Nomenclature in whole section is confusing

P5 L18: clarify "amplifies difference between clouds and aerosols"

P5 L29: is "known" the correct term for the air molecular density profile?

P5 L30: "very little" should be more specific in this context, give an example of how much the molecular scattering signal would vary with density from a 1064nm research lidar (if it would be detectable there, must be some reference out there) to put this into context

P5 L29-P6 L3: Sentences starting "Molecular scattering..." going to ..."hardware generated noise" somewhat unclear and redundant. Please be more specific here-it might be sensible to address this point about molecular backscatter to someone used to working with higher specification lidars, explaining clearly the lack of sensitivity. Also there is a conference paper from Potenza that shows molecular profile can be retrieved from CHM-15k when averaging for hours at night-Binietoglou et al, can't remember

year.

P6 L35-P7 L1: “Hence if sufficient profiles are averaged, the ringing becomes less apparent in the climatology” This is counter intuitive-I would expect the ringing to become more pronounced with averaging. Can you offer any brief explanation of why this is? Is it because the fundamental ringing frequency(ies) change(s) with changes in gain, background noise, laser power, temperature?

P7 L26: “Dark Current” is an inappropriate term for this measurement, as that term typically relates only to the detector. Something like “instrument noise” should be used, as this encompasses any electronic and optical noise inside the instrument.

P7 L27 & L28: “Background profiles” and “Background Noise profiles” might also be misleading term that could be confused with background light. Try to either change this or qualify it. Not easy to do, but just make sure you clearly define your terms and are fully consistent throughout the text. Perhaps “instrument artefact signatures” or profiles? Background may be confusing, but if you use that term define it very carefully. Later P9L15 you say “electronic background”. This is perhaps better. Only problem is it can also have an internal optical component, but maybe you can just mention that the first time you say this.

P10 L26: For the overlap multiplication factor, do you mean 1/(x→0) to 1/1 ? I guess this is pretty clear from equation 7.

P11-12: Section 4.2 and Figure 5 should be explained more clearly. Perhaps a schematic of a signal across the lowest range bins for each example of your corrections for the different criteria would help, before you show the actual signals. Just keep in mind that your audience could confuse the different effects of overlap, obstruction correction, etc., that you are trying to deal with here.

P13 L23: averaging factor of 1000, can you relate this to averaging times for typical capture settings?

P14 L4: is there a reference you can cite on how this noise floor is established? Given what you said earlier about low frequency artefacts, this could be slightly problematic. Just justify this choice given what you said earlier.

P14 L22: just to clarify, the relative variance test works because you get a small non-zero mean backscatter, which brings the ratio down, yes? This could be slightly confusing, because if we had strong signal from a thin supercooled water layer, we might find a larger ratio rather than a smaller one. But presumably this is eliminated by averaging over the extended range you’ve selected, is that right?

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