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Atmospheric Measurement Techniques Discussions

Interactive comment on "EARLINET Single Calculus Chain – technical – Part 1: Pre-processing of raw lidar data" *by* G. D'Amico et al.

Anonymous Referee #2

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General comments

The manuscript describes the pre-processing tool developed under EARLINET. It is a very technical document which describes the technical implementation of well known procedures reported in the literature. The novelty is putting all together in a comprehensive framework that can deals with the large variety of lidar systems in Earlinet. To the knowledge of this reviewer, two proposed algorithms are also novelty: the correction of the trigger-delay by a non-integer number of bins, and the automatic selection of the region used for gluing.

Specific comments

On p.10394 L.21 and p.10406 L.1-2, the authors mention that clouds need to be manually screened before input to the SCC. They also mention that an automatic SCC module for cloud screening is under development. I understand that this is an important milestone before one can really call SCC a "fully-automatic single calculus chain". Therefore, I suggest to the authors to mention the cloud-screening efforts in their conclusions.

On p.10401 at paragraphs starting at L.10 and L.15, the authors describe how they do a linear interpolation of the lidar signal to account for the trigger delays in each channel. They explain that if the delay happens to be exactly an integer amount of time-bins, then the linear interpolation is just a bin-shift.

However, I argue that because the delay is a real number calculated from a minimization routine, it will never be exactly an integer number of bins. Therefore, their algorithm will introduce a correlation between the signals in neighbour bins and thus the noise will not be independent anymore and cannot be estimated as 1/sqrt(counts). At least to my knowledge, the usual procedure would be to round the real value to the closest integer, and then just do a bin shift. Of course this has disadvantages as well, as a positive or negative bias will be introduced.

As this is an important milestone paper that will potentially guide other researchers outside EARLINET on their own algorithm development, I believe the authors should properly discuss this point. For instance, you could show or cite the papers that showed that linear interpolation is more correct (statistically) than shifting by rounded-integer values. If this is the case, it should be discussed how the error propagation (with correlation) is treated afterwards (in your Monte-Carlo routine).

On p. 10406, Line 19 until the end of the paragraph. Here the authors are talking about an analog signal that is not linear above a high limit S and below a low limit S/F. It is not clear, however, how S and F are determined for each channel. I tried to do

the estimation myself considering a standard Licel ADC with range R (e.g. 500mV). The high limit value S would be R/2 and the low limit value would be $5 * Resolution = 5 * R/(2^{bits} - 1)$. Hence, $F = (2^{bits} - 1)/10$ and even a 16bit ADC would be just "sufficiently good" with an $F \sim 6500$, much lower then the author's values. Hence I ask the authors to clarify how S and F are defined.

On p.10408, paragraph starting at L.5, the authors search for the $min(Sf - KSn)$. However Sf and Sn are vectors and hence each position in $Sf - KSn$ could be positive or negative while searching for the best K. Please clarify if this was supposed to be the minimum of the module of the difference vector, or $min(|Sf - KSn|)$, or if it is something else that is not clear.

On p.10408, paragraph starting at L.10, the author's statement is not clear from the statistical point of view. There is only one value of k so it cannot be normally distributed around a null mean value. A suggestion would be: "... the slope k should be compatible with the null hypothesis and the residuals R should ...". Another alternative is "...the slope k should not be significantly different than zero and the residuals ..."

Technical corrections

I suggest to remove text in [] and include that in ()

p.10394 L.21 – "... low-level clouds should [be] not (be) included in the NetCDF..."

p.10397 L.24 – "... window should include[s] only ..."

p.10398 L.23,24 – "...to count the number of [the] events in..."

p.10408 L.13 – "... resulting from [of] the least square..."

Interactive comment on Atmos. Meas. Tech. Discuss., 8, 10387, 2015.