Review of «**An improved post-processing technique for automatic precipitation gauge time series**» by Amber Ross, Craig D. Smith, and Alan Barr, *Manuscript Number: amt-2019-423.*

List of specific comments

Throughout the paper

In the introduction, you do name three post-processing challenges: mechanical and electrical interference, diurnal oscillations, and evaporation of the bucket contents. While you treat mechanical and electrical interferences and evaporation explicit with your filtering method, possible diurnal variations as the temperature dependency of the measurement device are treated more implicit with the introduction of a 24h measurement window, where you can assume similar temperatures at the end and beginning of the cycle without explaining this part of the algorithm.

However, synoptic changes can make this assumption not valid and thus some of the detected precipitation or evaporation can be due to temperature changes independent of a diurnal cycle. I don't think that this is problematic for your results, but I suggest to discuss this issue throughout your paper .

Section 2.4 Segmented Neutral Aggregating Filter, page 6, algorithm description and Figure 1 in Appendix (flowchart):

Please clarify that the measurement interval in your case is actually a minute or has to be a much shorter interval than the 24 hour segments. I think it may also help if you punctuate (in addition to the use of indices) when you are treating the 24 hour segment as one: i.e. all individual measurements from one interval is assigned the same flag "precipitating", "evaporating" or "neither E nor P", and when you are treating minute by minute (each single measurement can get its individual P(i) or E(i), and from step 4 you evaluating minute values).

Please reword 6c. While the flowchart indicates clearly that if answers on both questions 6a and 6b are no, precipitation and evaporation are set to zero. That includes also (and especially) those cases where not all three overlapping windows do agree. After repeated reading of sentence "6c" and a look on the flowchart, I actually understood that 6c could be understand this way. However, I do suggest to rewrite and clarify the point that you are also looking for disagreement between the three flags here and not only for those cases where all three flags indicate (in agreement) no precipitation nor evaporation (the latter is how I understood the sentence when reading it the first time).

Section 3.1. Testing with pre-procesed (control) precipitation data

The description of the creation of the synthetic signal is very informative. I was searching after a figure illustrating the level of noise visual. Maybe you can hint other readers that figure 3 in the appendix actually have that kind of visualization. Also, in contrast to figure 2, where the difference between the three noise levels is not visible due to the higher overall changes.

Section 3.2 Testing with raw precipitation data

From your description, it becomes clear, that you actually include a double filtering. The QC process used for the WMO-SPICE analysis is already cleaning and smoothing the data series before you apply the described filters of this study. That is off course no problem, but I do think it is important enough that it should be mentioned earlier in the paper and also be taken up again in the discussion of the results. I am wondering especially about:

- Have you tried to apply your filtering algorithm without this additional SPICE-filtering and QC?
- In the operational use of your O15 filter, you calculate a 5-minute mean prior to filtering. Do you assume that the 5-minute average calculation would do about the same as the 4-minute Gaussian filter of the SPICE-algorithm?
- In case of your study, did you still use the 5-minute averaging step of the O15 filter after applying the 4 minute Gaussian filter of the SPICE-algorithm?
- Do you think a quality control of the time series is necessary before applying the filter? Especially when thinking of the O15 filter, but also for the other filters, it may be more usual to apply the complete or parts of the quality control on the filtered (with your algorithm) data - what are the advantages/disadvantages of either way?

Chapter 5 – Discussion, lines 364-372:

I think the necessity of antifreeze and oil, also when an algorithm is applied, is valuable information, which should also occur in the conclusions (in a slightly shorter form)

Use of Ott Pluvio2 data – throughout the paper

In the Introduction (lines 68-71), you describe that you are using somewhat processed values of the Ott Pluvio2 gauges. In Section 3.2 (lines 285ff.), however, you do not distinguish between data from Geonor or Pluvio2.

Do you apply the SPICE-algorithm on the preprocessed or the raw bucket data from Ott Pluvio2? To my understanding, the SPICE algorithm is meant to be applied to the raw bucket data. Depending on what you actually did, Pluvio2 and Geonor data may have been treated significantly different and I wonder if that should be visible in your results. Do you see any effect of a possible different treatment of the data from the different gauges? I was surprised to see that evaporation was detected in a similar manner for Pluvio2 gauges as for Geonor gauges even if (after my understanding) evaporation for Pluvio2 gauges were already treated from the inbuilt algorithm and thus probably be “treated” twice.

Appendix

Flowchart and figures 2 and 3 contain relevant information and I suggest moving them from the appendix into the main text.

Appendix, Figure 5

The lines are very thin and difficult to distinguish; the evaporation line seems to be almost constantly zero, due to the different orders of magnitude. You try to overcome some of these issues with the smaller inserts, but those makes the plots “untidy” and difficult to understand. Please consider to use several plots, shorter time intervals, or some other way to improve the quality of these figures.