Review of "Evaluation and Correction of Precipitation Types Measured by a PARSIVEL2 Disdrometer in a Tropical Glacier Environment"

In this work, precipitation measurements from a Parsivel² optical disdrometer in a tropical glacier system in the Peruvian Andes are evaluated. For this purpose, precipitation events from a one-year measurement dataset were identified in a first step. Subsequently, a precipitation category was assigned to each event based on particles size-velocity relationships and some additional meteorological parameters, i.e., near-surface temperature and horizontal wind. Eventually, the precipitation intensity was recomputed using revised bulk density values for each category. With this category-based density correction method, the authors managed to increase agreement of precipitation amounts detected by Parsivel² and collocated Pluvio² observations for most categories. The reclassification revealed large uncertainties in hydrometeor classification by the manufacturers software and thus in precipitation intensity as well.

In general, I think that the work is methodologically convincing, presents interesting results regarding particle classification and is worth to be published in AMT after some revisions. The manuscript would benefit in several places from more precise or clearer descriptions and argumentation. In addition, some figures in particular, as well as several passages of text, should be revised to better meet academic standards.

General comments

- At the end of the introduction, I would like to see a clear but brief description of the structure of the paper, i.e. the Sections and their content. I think that the sentence in line 51 is therefore misplaced.
- I expect the authors to carefully revise their "References" section, as multiple references contain comments (e.g. lines 635, 660, 671, 725), mistakes at author naming (e.g. lines 650, 671, 674) or other deficient entries (e.g. line 728)
- The Category "Rain Drizzle with Snow" should be renamed to "Rain/Drizzle with Snow" or similar (line 8, 295; Figures 5, 6, 7 (partly including captions))

Specific comments

- Line 11: The Parsivel² overestimated precipitation compared to what?
- Line 11: It's not so easy to understand what the percentage refers to; it's also hard to interpret the 3.92 mm if time periods don't have the same length
- Lines 23 ff.: All those references refer to the Andes region. This should be mentioned/specified, as those statements do not account for all tropical regions in the world.
- Line 45: There is a lot of research about the Parsivels performance with respect to particle size too. It would be nice if you could add one or two statements here on that.
- Figure 1: At which time of the year / date was the picture in the lower right corner taken?
- Line 124: What's the lower and upper size limit that is taken into account here? Consider to shift that part to Section 3.2
- Lines 124/125: Please revise the wording / structure of that sentence
- Table 1: Please mention in the caption, that this table is about the Parsivel data. Do the numbers refer to a monthly period each? In that case, don't name the column "Date" but "Period" and write start and end. Filter 1, 2 and 3 show the same numbers. Does it mean that Filter 2 and 3 did actually not filter any data? Please explain / mention that somewhere, preferably under 2.2.4.

- Line 134: Consider to name Section 3.1 “Precipitation Type Identification”
- Line 145: Consider to rename this Section. In here, you are describing how precipitation parameters are calculated rather than the (size) spectrum is defined.
- Section 3.2: Is it known, which densities (or mass-velocity relations) are assumed by the OTT software for which types? If yes, it would be great to note them here. If not, I don't understand correctly how you deal with this as one could interpret Equation 3 in such way, that you are using the precipitation rates from the OTT program for your correction.
- Section 3.3.1: This section is compact enough that no subheadings are needed. I suggest to remove them and instead add one sentence at line 178 which bridges to the selection criteria.
- Line 181: Perhaps add here again, that this refers to any of the sensors.
- Line 195 f.: This sentence needs rewording and perhaps a few more words for explanation.
- Line 199: I suggest to name that point "Rain" and state that drizzle is also part of it. If those bullet points are named the same way as the categories in the table and the Figures, the message becomes more clear
- Line 202: "some other types" is very unspecific. If you mean other crystal types / crystals with other shapes etc., write it like this.
- Line 209 f.: I think that this information is misplaced as you are mainly listing the five different classes here. Consider to give that information as normal text after the bullet points.
- Figure 4:
    - Increase legends!!
    - Increase the fontsize of "(a)" etc.
    - Remove y axis label from panel e
    - Increase tick labels on both axes
    - Stay consistent with conventions --> m/s to m s-1, if equations should remain, write exponents as superscripts instead of **, etc.
    - I suggest to remove the equations as they are contained in Table 2.
    - I also suggest to somewhere include the respective category name somewhere in or above each subplot.
    - Caption: you are naming six categories here!
- Line 224: Rewording suggested: "Further literature suggests..."
- Line 228 ff.: Heymsfield and Hobbs (2010) would be another important reference here but I leave it up to the authors whether to include it or not
- Equation 3: Is P the precipitation rate? This was previously introduced as R (Eq. 2). Please carefully introduce the variables and abbreviations here. Furthermore: Do I understand it correctly, that you are using P from the OTT software and multiply it with the newly assigned density for that particle type? I struggle a bit with the fact that the OTT software likely already performed a "density correction" for solid particles (as you indicated in Eq. 2). So if you are using P from the software, aren't you correcting a second time for the density? Please clarify.
- Figure 5 and Figure 11: I like the idea of presenting two pie charts for the category distribution before and after your correction. The labels and numbers, however, need to be displayed clearer, i.e. without overlapping and with an appropriate font size! Consider to display the text and numbers outside the chart and connect with lines to the respective fields. Perhaps, display the phase inside and the more specific categories outside. Also consider to use yellow-like colors instead of green to make the figures more color-blindness-friendly.
- Line 295: I think the category should be named "rain/drizzle with snow" or "rain or drizzle with snow" instead of "rain drizzle with snow". Also update in the respective Figures, please!

- Figure 6: The figure would benefit from being a vector graphic. Also consider to use yellow-like colors instead of green to make the figures more color-blindness-friendly.
- Figure 7:
    - I assume that the data in plot (a) do not represent the actual logarithm of N(D) but are only plotted with a logarithmic axis. Therefore, the y axis label should be "N(D) (m^{-3} mm^{-1})" without the log10 beforehand
    - Increase legend a bit
    - Increase tick labels (and reduce the amount a bit)
    - Caption: “both decreasing with increasing particle diameter” is not true, e.g. for V(D) of solid particles up to 6.5 mm
- Lines 332 - 334: Please reword and explain your findings a bit more clear and detailled. Explain clearly, what exactly is here the discrepancy. Take care that the sentences do not sound like a Figure caption. If you write about graphs, also mention in this sentence again, that you speak about Figure 8.
- Fig. 8: would profit from larger Legend font sizes. Consider to plot the number of occurences in the lower right corner of each plot instead of behind the Category name. The colors of the composite plot are a bit hard to interpret as they have different scales than the legend. Would it make sense to squeeze each of those seven single color bars into the respective secment of the composite color bar? Maybe with a different color scheme?
- Line 359: Actually it just indicates that the parsivel is more sensitive to light precipitation than the Pluvio.
- Fig. 9:
    - consider to adjust font sizes of axes labels and tick labels so that they are more equal
    - Why are the axes labels bold in this figure but not in most others?
    - consider to use an axis break for the x axis at 500 min with a more condensed second part (I leave that up to the authors)
    - Legend:
        - I suggest removing "Type"
        - "Pluvio_registered" could be rewritten to "registered by Pluvio" but it is confusing, does it mean only detected by Pluvio? otherwise, it should be an asterisk, or am I wrong?
        - ideally, place the legend in some corner, like the lower right one
    - Caption:
        - Please revise with regard to typos and grammar (e.g., Comparison of, no semicolon, missing or redundant whitespaces). I also suggest to change "colors dots" to "color code", "black asterisk" to "asterisks", "black dot" to "dots", and "extracted from total events 129" to "extracted from 129 total events". "the number of intense occurrences (...) is labeled on the yellow-marked locations." could also use some rewording.
- Figure 10:
    - Add (a) - (c)
    - in general, I would suggest to not show titles here but describe a to c in the caption.
    - (a): plot the curves last, so that they are in the foreground
    - In the legend, I suggest to only label the two instruments as lines but label the categories as boxes/patches, otherwise, the legend is not directly clear
    - 47.9 mm / 8.2 mm is not directly clear, write that part in the caption and explain which number belongs to which instrument
    - (b) and (c): please adjust the width of the color bar and revise color bar labels (units!)
    - I suggest to plot the diameter only to 17.5 or so to beter resolve the range with the actual data
    - this figure would benefit from being plotted as vector graphic

    - Caption: I suggest "overestimation event 80 on March 17, 2023 showing time series of (a) Precipitation intensity colred by classified type, (b) mean fall velocity by particle size, and (c) ..."
- Figure 12:
    - Consider to plot this as one-column figure and as one figure without having three subfigures. Consider to only have y ticks at 0.2 steps.
    - Please revise y axis label.
    - Caption:
        - stay with unit convention (g cm-3)
        - I suggest "Distribution of density values grouped by..." and "The density values range from ...".
- Line 467: Can you comment a bit more on why "poorly constrained uncertainty" would be introduced? Did you try that for liquid precipitation?
- Figure 13:
    - it's not common to have a title above the figure. Better use the first Sentence of the caption for that
    - the "Note" box is redundant as the info is given in the caption
    - an increased font size for tick labels, equations, and the legends would be beneficial
    - Why are labels bold but in most other figures not?
- Line 503: What do you understand as contaminating particles? Like insects etc.? Could it be also wrongly detected hydrometeors, like two at the same time etc.?
- Fig. 14
    - needs to be replotted. See comments on Fig. 7!
    - Caption:
        - the comma after (a) should be removed
        - the second sentence should be revised with respect to grammar and content.
        - "cleaned" is not ideal here, I suggest "removed after the correction"
- Line 547: This reference is also about the MASC. I suggest to name three types of imaging systems instead (like MASC, PIP, VISSS; including references)
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Technical comments / typos

- Please stay consistent with the spelling of the Parsivel² instrument. You are changing between PARSIVEL2, PARSIVEL², and Parsivel2 – please decide for one. This concerns as well the title, abstract, and axes labels of figures.
- Same with the PLUVIO²S / Pluvio2 / Pluvio² / PLUVIO² (stay with “Pluvio2” if you make the statement in line 92)
- Please revise the semi blank spaces between number and unit in the whole manuscript!
- All Figures and Tables should be displayed at the top of the page! This is currently not the case for Figures 2, 3, 4, 7, 11, 12, 14 and Table 3.
- If possible, plot your figures as vector graphics
- Line 30: “measurements” instead of “measurement”
- Line 60: Whitespace missing before “The”
- Line 66: stay consistent, either use “-“ or “to” when describing ranges
- Line 70 and 71: unit convention! (mm day-1)
- Line 75 and 76: are parentheses missing around “Fig. 2d”?
- Figure 2: enlarge the tick labels, legends, second y axis label at c), and the letters a) to d)! Also stay consistent with the units on the y axes (mm d-1 and m s-1 instead of mm/d and m/s)

- Line 130: redundant whitespace
- Line 132: redundant parentheses
- Equation 1: should the second “n” be an “m”? Otherwise n=m=32 in line 154 would be redundant
- Line 159: introduce abbreviation "R" here
- Line 201: there is no Figure 11a
- Line 203: I suggest “from 0.5 m to the …“
- Line 205: there is no Figure 11c
- Table 2: If hailstones and hail belong to the same category, I suggest to remove the horizontal line which separates them. Does it make sense to include the bulk densities in this table? I leave it up to the authors.
- Line 206: I suggest “>10 mm in diameter”
- Line 207: redundant whitespace and missing parenthesis behind “(2014)”
- Line 258: “mm diameter” needs rewording
- Line 260: “adjusted measurements adjusted” needs rewording
- Line 262: define RMSE here instead of in line 265
- Line 277: I suggest “weak-updraft low-layer clouds”
- Line 286: “3 m s-1”: 2.9m/s written in line 282, I suggest to not mention it here again. Otherwise, the number should match with the one at line 282.
- Line 291: update reference!
- Line 294: "observe" might be the wrong term here
- Line 313: I suggest starting a new sentence with “Moreover”
- Line 335: minute-by-minute
- Line 338: should “D<1 mm” be in math mode?
- Line 347: missing whitespace
- Line 348: I suggest removing “3.3.1”. I also suggest “For fifteen events, the recorded duration was below 10 minutes...”
- Line 349: weighing instead of weighting
- Line 351: Q3 and IQR should be defined when used the first time
- Line 353: I think that it's common to order the Figures according to their first appearance in the text. Therefore, Fig 13 should be Fig. 10. Perhaps, give a statement that in Section ..., you are explaining / discussing the results of d to f from this figure.
- Line 355 f.: missing whitespace, wrong placement of comma; comma instead of point; linear instead of lineal
- Line 365 and 371: add whitespaces between numbers
- Line 366: Why the x and the "?
- Line 376: mm min-1
- Line 405: missing whitespace
- Line 424: methodology: "method" fits slightly better, one could also skip the work completely
- Line 439: I suggest to delete "reliably" here.
- Line 471: pre-existing
- Line 473: 2 missing commas after “point” and “it”
- Line 498: missing whitespace
- Line 501: non-monotonic
- Line 502: size-velocity
- Line 515: pre-correction
- Line 535: I suggest “hydrometeor type”
- Line 541: missing whitespace; event-integrated
- Line 543: whitespace; "This is a"

- Line 574: check names in reference
- Line 576: whitespace before “OTT”
- Line 584: I suggest “developed in here”
- Line 613: “acquired downloaded” needs rewording
- Line 614: missing “.” Behind “(2026b)”?
- Lines 635, 650, 660, 674, 725, 728: check references
- Line 671: doi: 10.1175/1520-0450(1969)008<0249:TVORA>2.0.CO;2 Authors name is Foote, not Footec!