

Interactive comment on “A video precipitation sensor for imaging and velocimetry of hydrometeors” by X. C. Liu et al.

Anonymous Referee #1

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This paper describes a new instrument to measure shapes and other characteristics of rain drops falling through its sensor area. Details of instrumentation are given together with image processing and calibration procedures. Results are presented but only for small and tiny drops and for low rainfall rate events.

It is a reasonably well written paper and well structure but it lacks clarity in many places.

1) Line 23 under section 2.1: What are EP and XP

2) Section 2.2: The authors claim that the horizontal and vertical velocity for each particle can be determined depending on the exposure interval and the displacement. The authors should note that this is only in one plane (say X-Z) and does not include the velocity component in the Y-Z plane and hence only limited or partial information

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can be obtained.

3) Para after eq. (1): It is not at all clear how orientation is determined from each image.

4) Fig 6: Much more information is required to explain this figure and how it related to the flow chart in Fig. 5.

5) Fig. 9 is presented without any explanation; if it is an important figure, then explain what the image array represent in a step by step manner.

6) Section 5, 2nd para: how is the canting angle derived – please explain.

7) Section 5, 2nd para: The Atlas-Ulbrich 1977 formula is not correct. The authors should be comparing with the Atlas et al. (1973) formula for the velocity - diameter variation. The reference is wrong but Fig. 10(a) contains the right curve and the formula.

8) Fig. 10(b) shows an enormous amount of spread in axis ratios – other previously reported measurements show much less variation. Why is this?

9) Fig. 10(c): was his derived for all drops including the small and tiny drops, and if so what errors are to be expected - please quantify for various diameters.

10) Fig 11: It would be more informative if rain accumulation comparisons are also included. Also, it is to be noted that only a light precipitation event is considered in this case.

There are also some minor language errors.

Significant revision is recommended. The authors should stress that their measurements basically represent projections of the drop shapes onto only one plane and hence will have limitations and restrictions on axis ratio measurements, particularly if drops are oscillating with significant component of the asymmetric modes, which will give rise to drops without any axis of rotational symmetry. The authors should also note that when referring to Tokay et al. (2001) and Saylor et al. (2002) on page 10167, there

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have also been several publications relating to 2DVD based drop shape measurements since then, and that the authors of the second reference in particular (viz. Saylor, Testik et al.) do not have much understanding of the principles behind the 2DVD instrumentation and have made many erroneous statements in their publications regarding 2DVD – which regrettably have gone unnoticed until now.

Interactive comment on Atmos. Meas. Tech. Discuss., 6, 10165, 2013.