

Review of “How observations from automatic hail sensors in Switzerland shed light on local hailfall duration and compare with hailpads measurements”, by Kopp, Manzato, Hering, Germann and Martius, AMT-2023-68.

This is a worthwhile study that reports on data from automatic hail sensors based on the Löffler-Mang et al. (2011) instrument. There were 80 of these automatic hail sensors operational in Switzerland, some of which acquired data from 2018-2022. The observations were compared with data from a hailpad network in northern Italy. Some interesting aspects of the hail sensor data were examined, including the duration of hail, when the largest hail was observed relative to the beginning of the hail event, etc. My comments appear below. I recommend that the revision considers my comments below.

### **Main Comments**

This article has many similarities to the Kopp et al. (2022) article that you cite. You do mention that in the text. Perhaps you could add a sentence on some of the results from that article.

I tried to find the Wetzel (2018) article in MTI but couldn't. You may want to add references to the instrument that appeared in the Kopp et al. (2022) article.

Eq. (1). A square root sign when a variable is taken to the  $\frac{1}{4}$  power. Please convert it to  $[ ]^{0.25}$

When a comma, should be used, for example 10,200 you have 10'200. There are many places where this needs correction. For example, line 43: 12'300

Using the values you provided for the variables in Eq. (1), I did a curve fit that relates diameter to kinetic energy. The goodness of fit is almost 1.00. I did the same thing using the values presented in Heymsfield et al. (2018). As you can see from the figure below, the spherical assumption results in hailstone diameters that are perhaps 30% *smaller*. It took me a while to figure out why but after thinking about it is definitely the case. In Figure 12 of the Kopp et al. (2022) article, there are good examples of why you should consider non-spherical particles. I feel extremely strongly that we need to move forward acknowledging that the assumption of

spherical hailstones needs to be replaced with current knowledge-not citing studies from the 1970's. I suggest that you include both spherical and the "nonspherical" hailstone assumptions in your discussion (lines 98-100, etc.)

Section 2.1.6. What if the hailstones 5 to 7 mm are non-spherical. They could be considered raindrops?

Could you add nonspherical hailstone diameters to Fig. 6a. Would this improve the agreement between the hail sensors and hailpads?

As you know, probability is not concentration. The concentration is the number per cubic volume (meters). Could you estimate the terminal velocity to get the concentration? That would be useful information. In fact, in this way you could compare your hail size distributions to the article by Federer and Waldvogel, and others from the 1970s. Also, the impacts on the hailpads are not likely to be spherical because of the non-spherical shape of large hailstones. In fact, the shape of the impacts could be examined for non-sphericity. This has been done in the past.

I like the idea of characterizing the duration of the hailstorm events at the ground and its distribution with time. Could you possibly link radar data to your hail impact data and then in the future be able to use radar data to refine the estimates of hail duration?

3.3.3 Timing of the largest hailstone. Just a thought. Prior to the largest hailstone, what do you observe in the rain category? Perhaps the smaller hailstones melt prior to reaching the surface and only the larger ones survive the melting process.

### **Minor Comments**

Title. Hailpads should be singular, Hailpad.

Lines 1, 15. Measuring the properties of hailstorms

28. "cheap" to "low cost"

160-161. I very much like the idea of using radar to identify when hailstorms are in close proximity to your sensors.

175. Canada or the United States? I didn't have access to the Brimelow study

205. Good idea to look at a range of time intervals

Figure 5a. Put in the alternate diameter. This would be very useful here.

437-438. Could there be video cameras that are turned on and off by the hail sensors when they detect hail? That might provide another means of characterizing the hail events.

More of my comments will be given in a revision.

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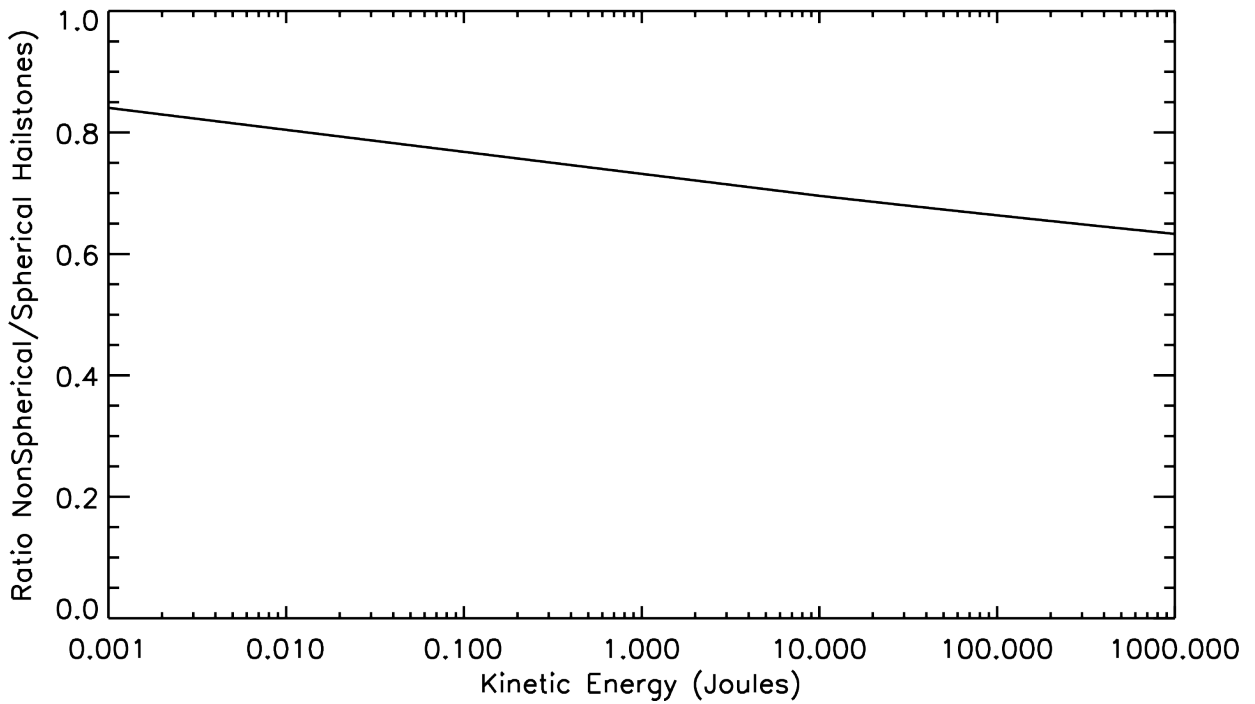
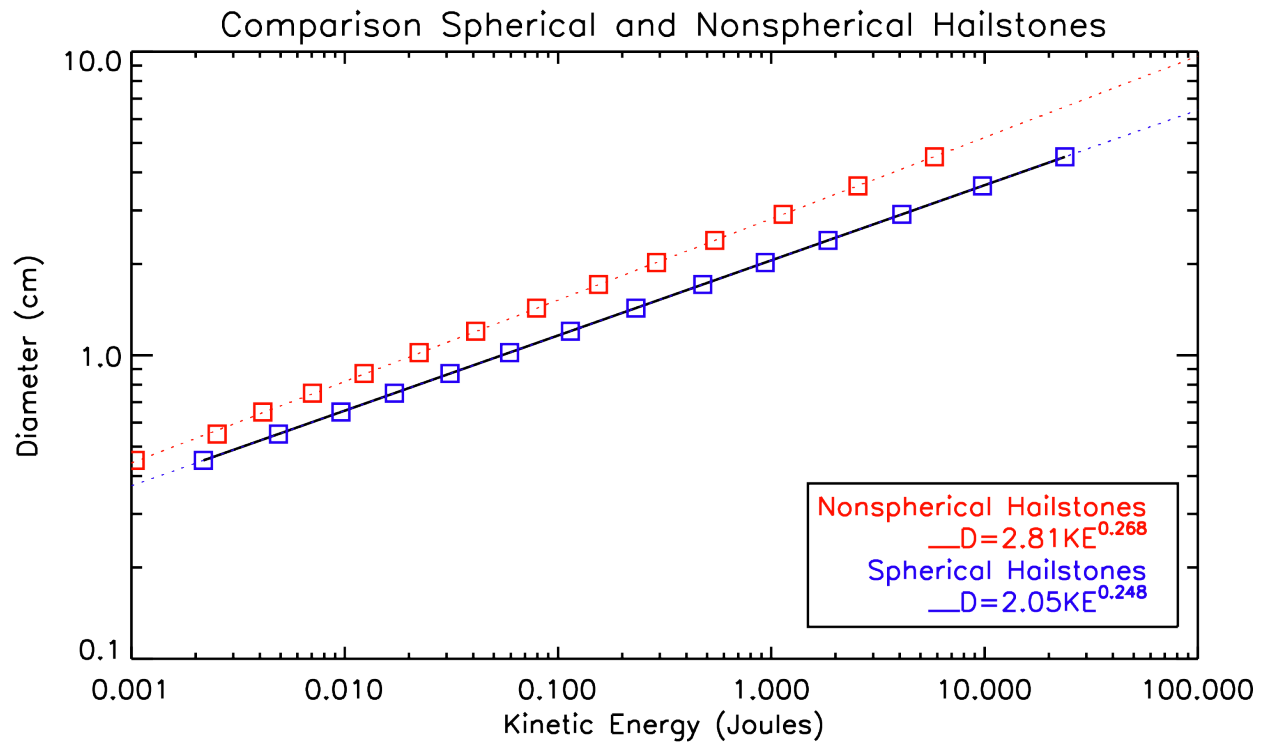


Fig. 1