

## ***Interactive comment on “Measuring precipitation with a geolysimeter” by Craig D. Smith et al.***

### **Anonymous Referee #2**

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This paper could make a useful contribution by quantifying the relationships between a precipitation gauge and a geolysimeter. The authors have done a good job of identifying many of the hydrological processes which can account for some of the differences between the sets of measurements, particularly those of the snowfalls.

Unfortunately, the authors have not adequately accounted for the difference between the areas of the rain gauge and the geolysimeter. The areal reduction factor, which quantifies the reduction of rainfall extremes over a region, compared to a point, is well known in hydrology. ARF values have been derived for many regions and are a standard part of engineering hydrology. Because the area of the geolysimeter is so large (almost 5 km<sup>2</sup>) it approaches the sizes of the regions referenced in some published areal-reduction factor curves.

More theoretical analyses (De Michele et al, 2001, among others) also demonstrate that the reduction factor is related to the size of an event, which is also shown by the

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plot of the geolysimeter and gauged rainfalls in Figure 3. However, the reduction factor also depends on the length of the event, while the authors have combined events of varying lengths. It would be possible to compare areal reduction factors for intensities, durations and frequencies derived from the data with published values.

At the very least, the effect of the area of the geolysimeter on the difference between its rainfall estimates and those of the gauge needs to be addressed.

De Michele, Carlo, Nathabandu T. Kottegoda, and Renzo Rosso. "The derivation of areal reduction factor of storm rainfall from its scaling properties." *Water Resources Research* 37, no. 12 (2001): 3247-3252

General The writing needs revision. The language is excessively colloquial and the terminology is frequently sloppy. A few examples are shown below

Page 1, Line 15 "Correlations varied from 0.99 for rainfall to 0.94 for snowfall." I believe that you are referring to the correlation coefficients of the linear regressions ( $r^2$ ) rather than values of correlations between the data sets.

P 3, L 3 "wider area" Area is not the same thing as width! This sloppy usage is repeated throughout the document.

"(hectares vs  $m^2$ )" The exact areas of the gauge orifice and of the geolysimeter and their ratio should be given. This sentence grossly understates the ratio, i.e. the ratio of 1 hectare to  $1 m^2$  is 10,000:1. According to the manufacturer's website, the gauge orifice area is  $200 cm^2$ , i.e.  $0.02 m^2$ . If the radius of the geolysimeter measurement area is 1.25 km (as stated), then the ratio is more than 245 million to 1!

P 4, L 7 "This stress transmission" The previous sentence refers to the load (i.e. a force) and the pore-water pressure, not to a stress. Please make this clearer.

L 27 "at 13U 417810E, 5863437N." Why not specify the location by its longitude and latitude? They are global values, rather than being specific to a region, and are more easily understood.

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P 7, L 2 “and earth tides”

Earth tides were not mentioned previously, when discussing the adjustment of the raw data, but probably should have been.

P 8, L 13 “Evapotranspiration was likely minimal since relative humidity during the night ...”

Does plant transpiration of water ever occur at night? The word “minimal” is being used in a colloquial sense. It would be better to say “very small”.

L 21 “significant” This word should not be used in a scientific paper, unless you are giving the level of significance.

P 9, L 1 “Summary statistics ...” How were these computed? What program did you use?

L 5 “RMSE varies ...” The abbreviation should be defined. Also, since the gauge data are also believed to be in error, what you are actually computing is the root mean squared deviation (RMSD) between the two datasets.

P 10, L 29 What is an “adequate snow catchment”?

Figures P 18 Figure 1 caption “response area of  $\sim 1.25$  km” Area is not measured in km. This would appear to be the radius of the geolysimeter response area, correct?

P 24 Figure 7 It appears that a point is missing from the plot. There is a point plotted for largest gauge unadjusted precipitation, and for the sigmoidal adjusted value, but there does not appear to be a corresponding point for the exponential arctan adjusted value.

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