

Interactive comment on “More Science with Less: Evaluation of a 3D-Printed Weather Station” by Adam Theisen et al.

Anonymous Referee #3

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The manuscript presents the evaluation of low-cost meteorological sensors positioned inside a 3D-printed weather station. This evaluation was carried out by positioning the 3D-printed weather station close to a reference weather station belonging to the Oklahoma Mesonet network.

The study lasted eight months. The collected data were compared with the aim of both studying the performance of low-cost sensors compared to standard sensors, and to determine the longevity and resistance of the 3D-printed weather station.

The authors evaluated the performance of low-cost instruments by calculating the average difference and the correlation coefficient respect to data of the reference station.

The results are presented through a series of scatter plots for the various geophysical

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quantities (temperature, relative humidity, atmospheric pressure, wind speed and direction, UV radiation and precipitation) in which the data are also color-coded in order to highlight the sensor reliability over time and any changes. According to the authors, the results obtained show that some of the low-cost sensors can be a valid alternative to traditional sensors when the latter have high cost. The case of wind sensors is different, showing significant discrepancy compared to that of the Mesonet network.

I believe that this paper represents a substantial contribution not only in the simple evaluation of low-cost meteorological sensors but also in the study of the robustness of the structure of a 3D printed weather station. In fact, the need of a wider spatial coverage of atmospheric observations at ground (especially in some areas of the Earth) is something that concerns the international scientific community and the deployment of low-cost weather stations (both sensors and structure) can be a suitable and promising answer. However, monitoring weather conditions by low-cost weather stations has its limitations and paper like this can help to quantify these limits.

The paper is interesting, well documented and rather well structured: in my opinion it deserves to be published on AMT as it addresses scientific questions within the scope of the journal. However, I think some changes need to be made before the article is published.

The specific major comments are as follows:

1. A more detailed analysis of the comparisons of the low-cost and reference weather stations is necessary in order to show the clear differences between the two instruments, as the study using only scatterplots and average differences appears too raw and limiting. A more detailed and quantitative approach through merit factors (such as error, bias...) would be desirable.
2. Can be low-cost measurements corrected in some way in order to reproduce reference observations?

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3. Are there some meteorological situations/events in which the low-cost station performs best?
4. It is not very clear how the UV data of the two stations were compared, as it stated in the paper that they do not measure the same radiative components.
5. I think a table summarizing all the sensor differences/performances would be valuable to have a clear picture of the comparisons.
6. The comparison between the two rain gauges should be expanded: how the two instruments work on the basis of rain rate?

Minor comments:

1. Do you have any idea about the duration of 3D-printed weather station and its sensors without any maintenance located, for example, in a remote area?
2. Line 64: the average difference of air temperature is 0.81, while the related scatterplot indicates 0.82.

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