A28: Investigating the impact of averaging period on deriving moisture excess curves

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Peer review statement
This abstract has undergone single blind review by the ICMB25 Conference Scientific Committee.

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About the conference
The following abstract is from the 3rd International Conference on Moisture in Buildings (https://ukcmb.org/icmb25) held in UM Guimarães, Portugal, on the 23-24 Oct 2025. All abstracts published here underwent single blind review by the Conference Scientific Committee.

Abstract

Moisture excess is the difference between the indoor and outdoor absolute humidity. British Standard 5250 presents humidity classes which relate moisture excess to monthly outdoor temperature. These classes are useful for simulations and assessing moisture conditions. Comparisons of measured data with the classes often uses data averaged over shorter periods than a month, but it is unclear what impact the averaging period has on moisture excess. This study examined how hourly, daily, weekly, and monthly averaging influences moisture excess curves. The results show that only weekly and monthly averages produce similar curves, and that longer averaging periods reduce the range of outdoor temperatures captured. These results highlight the importance to specifying the granularity of data when comparing moisture excess.

Peer-review under the responsibility of the organizing committee of the ICMB25.
Keywords: Indoor air humidity; indoor climate; moisture excess; humidity classes.

1. Introduction/Background

Moisture excess is the difference between the indoor and outdoor absolute humidity. British Standard (BS) 5250 presents the concept of humidity classes which relate moisture excess to monthly outdoor temperature [1]. These classes are useful for assessing the moisture conditions of a building and as inputs for hygrothermal simulations. The classes have been derived “from buildings in Western Europe” [2] but further details on the data origins are not provided.

In the literature, measured moisture excess from dwellings has been compared with the humidity classes using averaging periods ranging from hours [3] to weeks [4]; however, the BS 5250 curves are based on monthly data. It remains unclear how appropriate it is to compare moisture excess data that has been averaged over different time periods. As averaging period increases, it is expected that the influence of short-term fluctuations in moisture production and ventilation on moisture excess would decrease. However, there has been little investigation into this. Thus, the aim of this work is to investigate the impact of the averaging period on moisture excess curves.

2. Method

The analysis method was similar to a previous study [5]. The IDEAL Household Energy Dataset [6] was analysed which consists of indoor temperature and relative humidity data measured in 255 dwellings monitored between August 2016 and July 2018. For this analysis, only data from bedrooms was analysed.

The indoor humidity load was expressed as the moisture excess (g/m^3) which is defined as the difference between the indoor and outdoor moisture content of air. The sensor data was resampled as hourly, daily, weekly or monthly averages. For each bedroom, the moisture excess was sorted according to the outdoor temperature using 1°C increments. For each increment, the maximum moisture excess was noted which allowed for a single moisture excess curve to be generated for a room. After plotting all the room curves, the 90th percentile was calculated which represents an upper boundary.

3. Results and Discussion

The results are shown in Fig 1. As the averaging period increases, the 90th percentile moisture excess curves shift downwards, although all curves exhibit a similar trend of decreasing moisture excess with increasing outdoor temperature. Longer averaging periods also resulted in the exclusion of some lower and higher outdoor temperatures, likely because such temperatures occur only for short time periods. Figure 2 shows the percentage reduction in moisture excess for the daily, weekly, and monthly data relative to hourly data. The reduction increases with longer averaging periods, but the weekly and monthly data are similar in reduction.

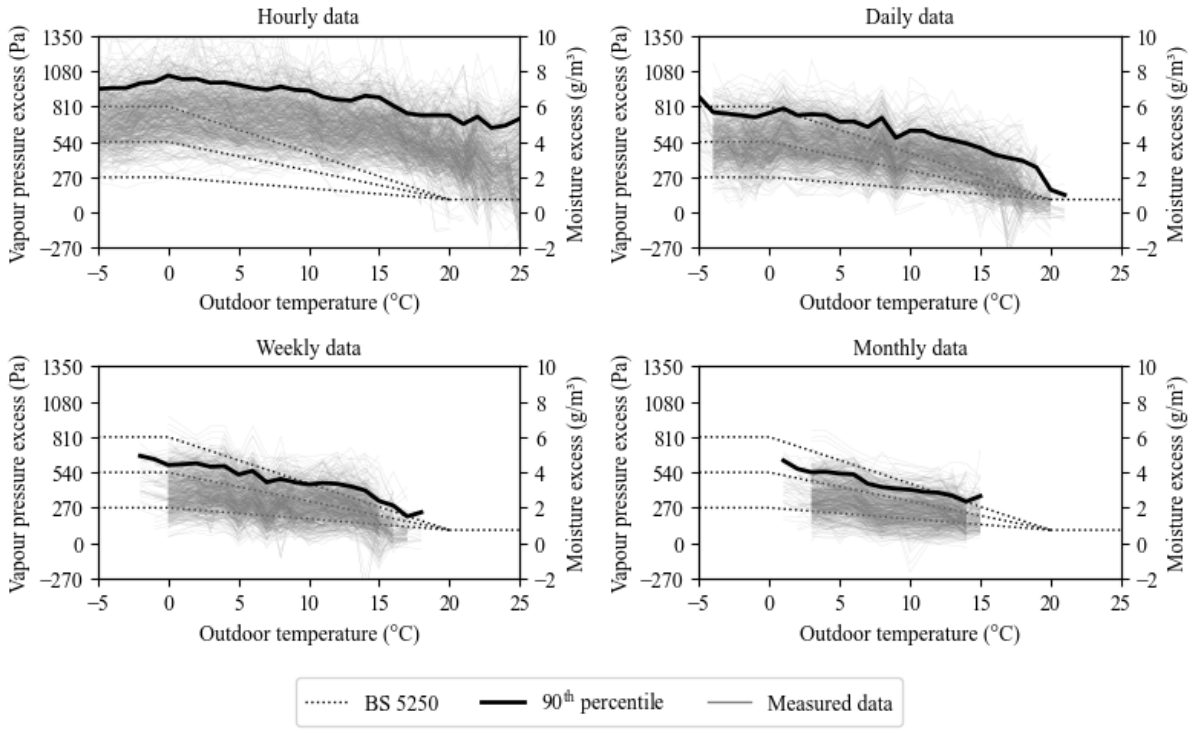

Figure 1. Moisture excess as a function of outdoor temperature for bedrooms. The dotted line ("BS 5250") shows the boundaries of humidity classes 2 and 3 which represent dwellings. The grey lines ("Measured data") represent individual rooms. The black line represents the 90th percentile.

4. Conclusion

Moisture excess curves derived from measured data are affected by the averaging period. The results show that only weekly and monthly averages produce similar curves, while large differences are observed when comparing hourly or daily data. However, all curves exhibit a similar trend of decreasing moisture excess with increasing outdoor temperature. Additionally, longer averaging periods reduce the range of outdoor temperatures captured, which is an important consideration if the purpose of analysis is to propose changes to the humidity classes. These findings also suggest that comparisons between weekly and monthly data may be appropriate, though further analysis is required.

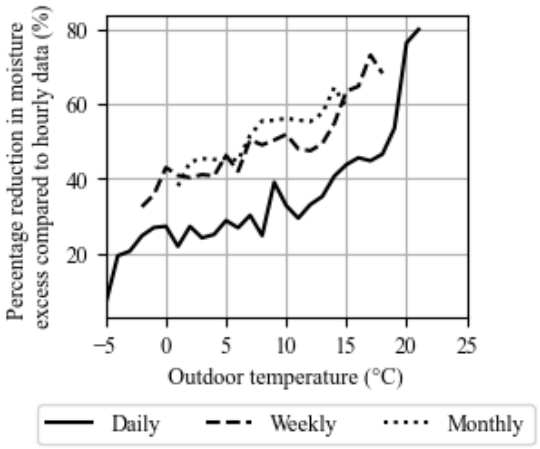

Figure 2. Percentage reduction in the moisture excess 90th percentile curves for daily, weekly and monthly data compared to hourly data.

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